Short Count Factoring Guide

July 2006

Washington State
Department of Transportation

Contents

Reason for this Guide

This guide was created by the Washington State Department of Transportation (WSDOT) to promote good practice and uniformity in techniques being used for traffic counting and the estimation of Annual Average Daily Traffic (AADT) figures from short duration count data. It is an informational guide only, and does not constitute a specification or a statement of required practice. The intent is to encourage high standards and uniform practices among traffic counting programs within the State of Washington so that an accurate representation of traffic on our public roadways is available to all interested parties.

The Need for Good Data

The demand for accurate information concerning our transportation systems is increasing every day. Our state and local legislative bodies require more precise and thorough analyses in order to understand the increasingly complex systems they must guide. They also require sound planning options from which to choose. Analysis and planning begin with the collection of data, and their quality depends on the accuracy and completeness of that data.

Governmental personnel responsible for monitoring, maintaining and enhancing the performance of public roadways also require thorough and accurate data. Good data is needed for making a myriad of decisions in the design phase of construction projects, including what pavement depth and type are to be used, how many lanes will need to be constructed, what type of traffic control device(s) will be most effective, et cetera. The proper administration of construction and maintenance programs is also dependent on the availability of complete and accurate data, which is used in part to schedule the implementation of these programs so that worker and public safety is ensured. Furthermore, good data is required for monitoring the physical state of pavement and bridge decks, congestion, and other aspects of roadway condition and performance.

In addition, private interests and research organizations often request traffic information. Traffic data and analyses can be an important component of business decisions and research efforts.

Data collected by state and local governments is also requested by The Federal Highway Administration (FHWA). The data is used in the administration of the Federal-aid Highway Program, which distributes federal funds to the states for the construction and improvement of public roadways. In addition, the data is used in the preparation of the Secretary of Transportation's Report to the United States Congress entitled *The Status of the Nation's Highways, Bridges and Transit: Condition and Performance*. This report is the basis for many decisions made concerning federal highway program design and funds allocation.

There are many other demands for data, and more are coming in the foreseeable future. It is outside the scope of this document to address all of these, but simply to note that data is becoming more important with each passing day. We are indeed in an information age.

The Scope of This Guide

This guide provides a general overview of traffic counting programs, as well as a more detailed discussion of suggested practice in relation to short duration traffic count field and office techniques. Short duration counts are those that are conducted over a relatively limited period of time, usually one week or less. In addressing such counts, focus is placed on those performed with the primary intent of developing AADTs in order to fulfill federal reporting requirements and help meet point-specific and area-wide traffic information needs. Special purpose counts, such as traffic signal warrant studies and counts for intersection design, will not be discussed. Information and requirements for these types of counts can be found elsewhere (e.g., *Policy on Geometric Design of Highways and Streets*, and chapter six of the *Manual on Uniform Traffic Control Devices*).

Target Audience

The target audience for this guide is state and local agency personnel responsible for conducting traffic counts, processing count data, and generating AADT figures from the base data collected. In providing information on good practices in this regard, basic techniques and general theory are stressed. The Federal Highway Administration's *Traffic Monitoring Guide* (TMG) is recommend for those interested in a more detailed discussion of theory and practice.

Larger local agencies may already have well developed traffic counting programs. In this case, the guide may be useful for introducing new personnel to basic traffic counting techniques.

General Purpose and Objectives

There are many good reasons for counting traffic, including:

- **Production of statistics**. Many valuable statistics flow from traffic counting programs. Examples include vehicle-miles of travel figures and AADT maps, as well as vehicle usage, truck flow and commodity movement patterns.
- **Highway program design**. Highway capacity monitoring and construction scheduling depend on good traffic data. Safety monitoring programs need accurate flow information to locate unusually hazardous areas. Pavement design requires AADT and axle loading information.
- **Highway finance**. Some categories of federal funds are allocated partly on vehicle miles traveled.
- **Transportation planning**. Traffic flow and demand is essential to system monitoring and planning. The first step in planning is to establish a database that is representative of present day conditions.
- **Information for the Public**. Governmental traffic counting programs are not specifically required to collect information exclusively for use by private individuals or organizations, but the data gathered should be made available. This creates an added responsibility for producing high quality data.
- **Research and analysis**. Highway data is required for many research studies in order to reach a conclusion. However, the conclusion reached can be no better than the data upon which it is based.

Three Elements of Traffic Count Programs

In order to meet these needs, most states have implemented a count program consisting of three elements:

1. Continuous Count Element
2. Coverage Count Element
3. Special Purpose Element

Each element has its own purpose and methods, and all three elements are essential to a complete count program. The three elements are discussed below, in the level of detail appropriate to the intent of this guide.

Continuous Count Element

The continuous count element consists of a number of Permanent Traffic Recorders (PTRs), which collect data constantly throughout the year. These PTRs are distributed throughout Washington so that the variety of operational characteristics found on highways within the state is represented. By providing detailed and continuous traffic information for a representative sample of highway locations, this network of PTRs allows the following to be produced:

- **Growth rates**. Growth rates can be calculated from one or more PTR sites and then applied to other highway locations with similar geographic and operational characteristics.
- **Seasonal and day of week variation information**. Traffic streams vary in relation to both day of week and time of year. However, short duration counts, as their name implies, are restricted to collecting data for limited periods that are always less than an entire year and often less than a full week. Because of this, the average daily traffic volume from a short duration count will generally fail to accurately reflect the AADT of the location where the count was conducted. However, due to their continuous operation, PTRs record data that represent the variation of traffic streams in relation to day of week and time of year. This information can be used to calculate mathematical factors for converting short duration count data to annualized figures.
- **Axle correction factors**. Many short duration counts are restricted to simply recording the number of axle passages. Because not all vehicles are limited to two axles, merely counting all axle passages and then dividing by two cannot produce an accurate vehicle volume count. Axle correction factors, representing the ratio of vehicles to axles, must therefore be computed and applied to data limited to axle volumes in order to generate reasonably accurate estimates of vehicle volumes. To this end, data from PTRs instrumented to count and classify vehicles by type and

number of axles can be used to calculate correction factors for application to short count data.

- **Analyses of traffic relationships**. Several traffic-related relationships are commonly used in the process of highway design. One is the "K" factor, which is the proportion of daily traffic occurring during the peak hour. For design purposes, the K factor is generally calculated using the thirtieth highest volume hour of the year. This factor is directly available from PTR data, and is commonly extended to other highways when site-specific information is not available. The same is true for the "T" factor, which represents the percentage of trucks in the traffic stream.
- **Estimates of truck volumes and weights**. Because PTRs are capable of classifying vehicles, they can provide factors for use in estimating total number of trucks on the state highway system. This is done in conjunction with a separate truck-weighing program, where the average weight of various truck classes is established. This program utilizes data from Weigh-In-Motion (WIM) PTRs, which are capable of weighing and classifying vehicles automatically as they travel over the site.

Appendix Two of this guide contains a map of the State Highway System showing the location of WSDOT's PTR stations. Data from these recorders is available upon request from WSDOT's Transportation Data Office. In addition, several reports containing summary-level PTR data may be accessed through the WSDOT homepage at:
http://www.wsdot.wa.gov/mapsdata/tdo/

Coverage Count Element

The coverage count element represents the main focus of this guide. It is primarily composed of short duration counts from which AADTs have been derived through the application of appropriate seasonal, day of week, and axle correction factors. The purpose of this element is to ensure that adequate traffic data is collected to fulfill federal reporting requirements and meet point-specific and area-wide traffic information needs.

The AADT information produced through this element has a number of applications, including use in the calculation of:

- exposure rates as part of safety analyses,
- vehicle loadings as part of pavement design,
- vehicle use as part of revenue forecasts, and
- congestion rates as part of transportation system performance monitoring.

When traffic volume data from coverage counts is maintained at levels of aggregation below that of a daily total, such as by hour and direction, the data has additional uses such as:

- traffic signal timing,
- air quality analysis,
- noise analysis,
- planning studies, and
- planning the timing of maintenance and construction activities.

The adequacy of this element in meeting its intended purpose is determined by the methods used in performing counts and factoring data to generate AADTs,[1] as well as by the thoroughness of geographic coverage provided. A discussion of good practice in relation to counting and factoring techniques is provided in the following sections of this document. However, a discussion of how many counts are needed and where they should be conducted in order to attain adequate geographic coverage is beyond the scope of this document. Readers are directed to the TMG, which provides a detailed treatment of this topic.

Special Purpose Element

The special purpose element is inclusive of counts conducted to increase geographic coverage over and above that provided by the coverage count element, as well as those performed to obtain traffic information for specific projects. This element includes counts for traffic signal warrants or design, interchange design, special studies of an

[1] Another important aspect of the coverage count element is the collection and maintenance of vehicle classification and truck weight information. However, these items are beyond the scope of this publication. Readers are encouraged to reference the TMG for a discussion of this topic.

environmental nature, or counts specific to a planned development or industrial facility. Counts performed for these purposes must be designed to accommodate the needs of each individual project, and will not be discussed in detail in this guide. However, if an accurate AADT can be generated from a special purpose count, then it should be included with the pool of coverage count information.

Temporal Factors Entering Into Short Count Accuracy

The primary purpose of a coverage count is to collect traffic data that can be used in the computation of an AADT for the section of roadway where the count was performed. However, due to resource constraints, traffic counting programs usually conduct the majority of coverage counts with portable equipment left in place for short durations, and collect data for each count location on a relatively infrequent basis. This limitation on the duration and frequency of data collection becomes a matter of concern because traffic streams vary over time. As a result, the average daily traffic volume recorded during the course of a short duration count will usually fail to reflect AADT accurately.

The following discussion addresses the types of temporal variation inherent to traffic streams, as well as methods for addressing this issue within a traffic counting program so that accurate AADT figures are produced.

Rate of Growth

Rate of traffic growth is one important temporal factor that affects the accuracy of AADTs derived from short duration count data. If traffic is growing at an average annual rate of five percent, and a count is three years old, the age of the count will likely contribute to an error of approximately 15%. Since it is not economical to collect traffic data at every count location every year, it has become common practice to update AADTs through the application of a growth factor.

Traffic growth does not occur evenly across all segments of a highway system. Economically depressed areas may exhibit slower growth than surrounding areas, or even experience a decrease in traffic. As a general rule, higher functional classes of roadway (i.e., interstates and principal arterials) exhibit the highest AADT growth rates, while collectors and local streets exhibit the lowest. Traffic growth is normally higher in urban areas than in rural areas, and is often particularly high near urban growth boundaries. Growth on higher classification arterials will generally be relatively steady, while growth on lower classes, such as collector highways, will tend to vary more in relation to local conditions.

The best source of annual growth rates for application to individual counts is the annual growth rate of count information on similar facilities in the area. When calculating growth rates in this fashion, care must be taken to ensure that enough observations are included to average out the random inaccuracies that are always present in individual counts.

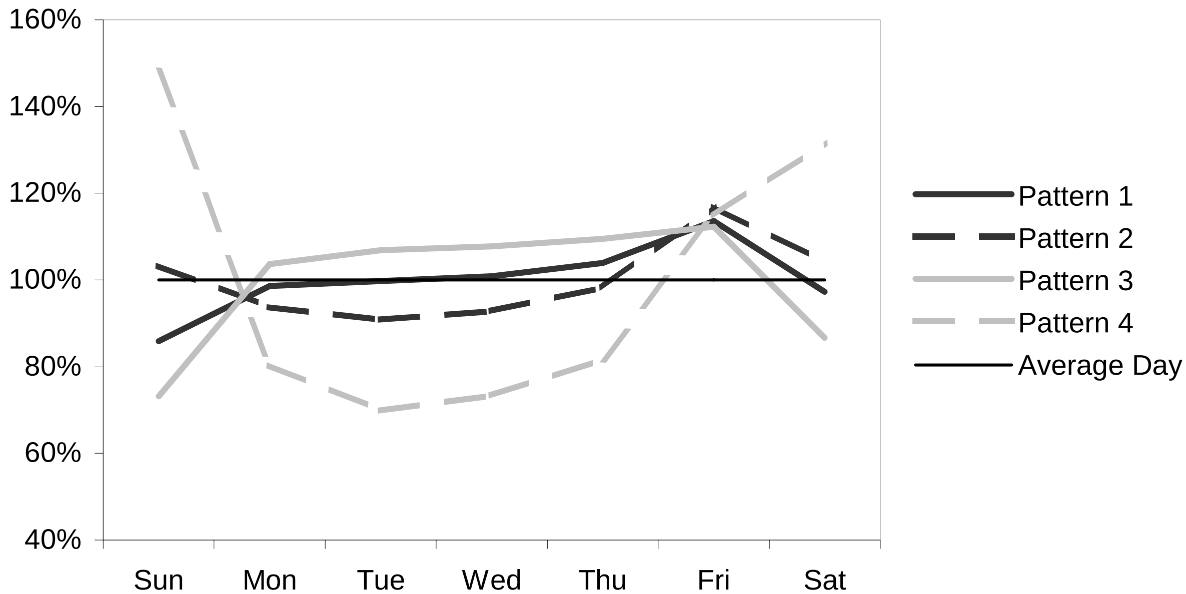
Appendix Five provides annual growth rates for ten broad categories of roadway on the state highway system. These growth rates represent averages, and may be used when better information is unavailable.

Day of Week Variation

Another systematic way in which traffic streams vary is in relation to the different days of the week. The characteristics of weekend and weekday traffic flows are generally different, with extreme changes being observable on some roadways. This is illustrated by the graph on the following page, which displays daily traffic volume as a percentage of weekly average daily traffic for four typical weekly traffic patterns found on the state highway system.

Pattern 1 is reflective of many urban and rural highway locations that display a Friday traffic volume peak and a Sunday low. Pattern 2 represents a large number of other rural locations where weekend traffic is slightly higher than average due to a modest weekend recreational travel influence. Pattern 3 reflects many other urban locations where job-related weekday traffic is a particularly large component of total weekly volume, resulting in Saturday and Sunday having distinctly low traffic volumes in relation to other days of the week. Finally, Pattern 4 characterizes mountain passes and other locations that are significantly influenced by recreational travel, resulting in a large proportion of weekly traffic occurring on Friday through Sunday.

Typical Weekly Variation of Traffic Volumes
Daily Traffic as Percentage of Weekly Average Daily Traffic



As suggested by the graph, if counts are conducted for less than one full week then day of week variations will often result in count data failing to accurately represent weekly average daily traffic. This issue must be addressed if reasonable estimates of AADT are to be produced from short count data. One method of doing so is to ensure that all coverage counts include at least one full week's data. However, this is often precluded due to portable equipment limitations, costs, and the increased likelihood of vandalism associated with longer counts. The alternate method is to multiply the average daily traffic figure from the count by a factor representing the ratio of average daily traffic for the week over the average daily traffic for the days of the week covered by the count. In mathematical terms the factor is expressed as:

WF = average daily traffic for the week / average daily traffic for the days counted
Where WF = day of week factor

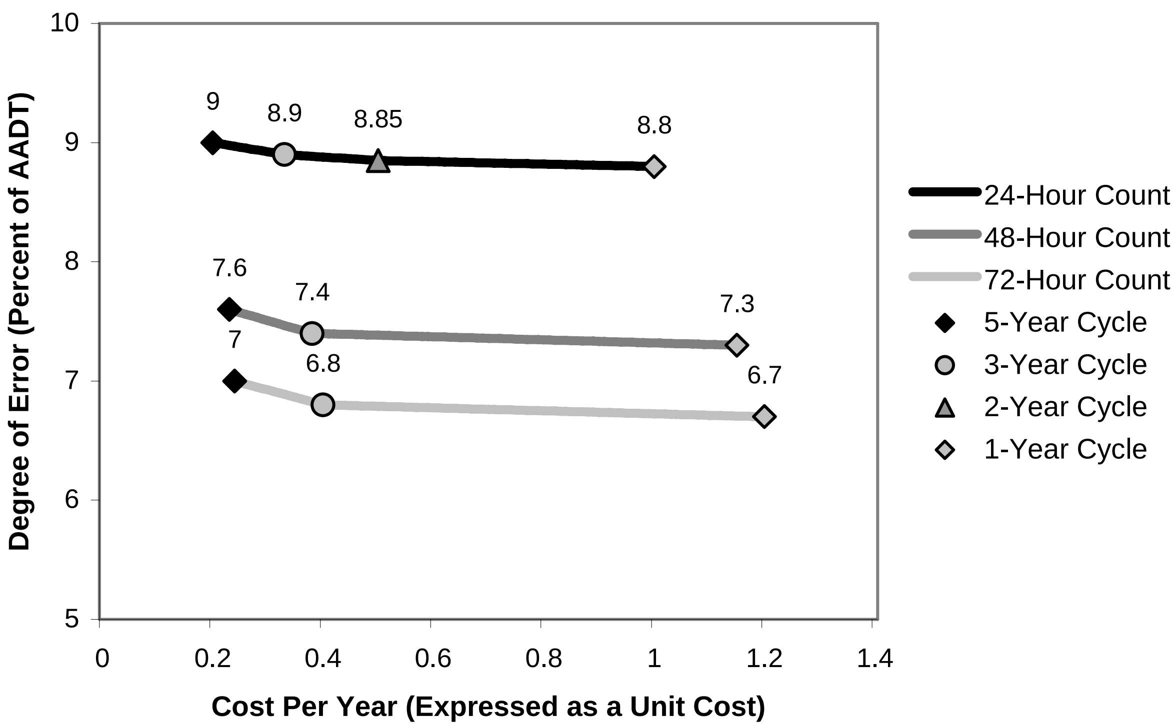
In practice however, the average daily traffic for the week will be unknown for the short count location where day of week factoring is required. As a result, day of week factors will need to be calculated for other locations (generally those with PTRs) and then applied to short counts conducted on roadway segments with similar characteristics. To reduce personnel time required to calculate and apply these factors, traffic counting programs are encouraged to standardize the days of the week that coverage counts are performed. In addition, because the day of week variation at a short count location will never precisely mirror the day of week variation of the location where factors are actually derived from, local programs are also encouraged to conduct coverage counts for at least 48 hours. Doing so will reduce the error inherent in factoring counts based on the day of week pattern found at other, albeit similar, locations. Similarly, coverage counts of less than one full week should not include data from noon on Friday through midnight on Sunday. This is because traffic patterns over this period tend to be relatively variable between locations that otherwise have similar patterns for the rest of the week, and therefore data from this period is less appropriate for factoring.

Random Variations

Traffic also varies due to less consistent influences, such as weather conditions, large sales at shopping malls, public events, or acts of nature like the 1980 eruption of Mount St. Helens. The practitioner should avoid counting when it is known that normal conditions will not prevail for such reasons. For example, counters should not be set on a fairgrounds road while the county fair is in progress or near a shopping mall the day after Thanksgiving, as doing so would lead to biased representations of average yearly conditions. However, factors that may result in traffic being atypical cannot always be identified when a counter is set. As with the systematic variability of traffic in relation to day of week, local agencies should address this issue by establishing minimum count durations that achieve desired levels of precision in relation to average daily traffic volumes. A discussion of considerations pertinent to the determination of minimum count durations is provided below.

Data Accuracy Related to Count Cost, Duration and Cycle

The TMG recommends that coverage counts be 48 hours in duration and repeated every third year, with growth factors being applied in the intervening two years. This recommendation is the result of cost versus accuracy studies, and is put forth as the most effective compromise between the goal of maximizing data validity and the constraints of cost and equipment limitations. The figure below is based on research cited in support of this recommendation.[2] It shows the relationship found between count duration, count cycle, degree of error, and relative cost of the count program. As can be seen, as count duration and frequency are increased, program cost rises while the level of inaccuracy in AADT estimation is reduced.



The actual design of a local agency's count program depends on local needs and available resources. However, as noted above, limiting count durations to less than 48 hours should be avoided. Count periods of less than two full days increase the degree to which

[2] Source data for the figure are from Hallenbeck, M. E., and Bowman, L. A. (1984). *Development of a Statewide Traffic Counting Program Based on the Highway Performance Monitoring System.* Federal Highway Administration, United States Department of Transportation.

day of week and random variations result in counts failing to reflect average traffic volumes, but do not result in significant cost savings as the time required to set up and take down equipment is essentially the same regardless of count duration. Collecting multiple days of data also results in a better statistical sample for quality assurance purposes, allowing staff to compare data from similar hours of different days and identify improper equipment functioning or atypical traffic patterns from events such as accidents or other unusual circumstances.

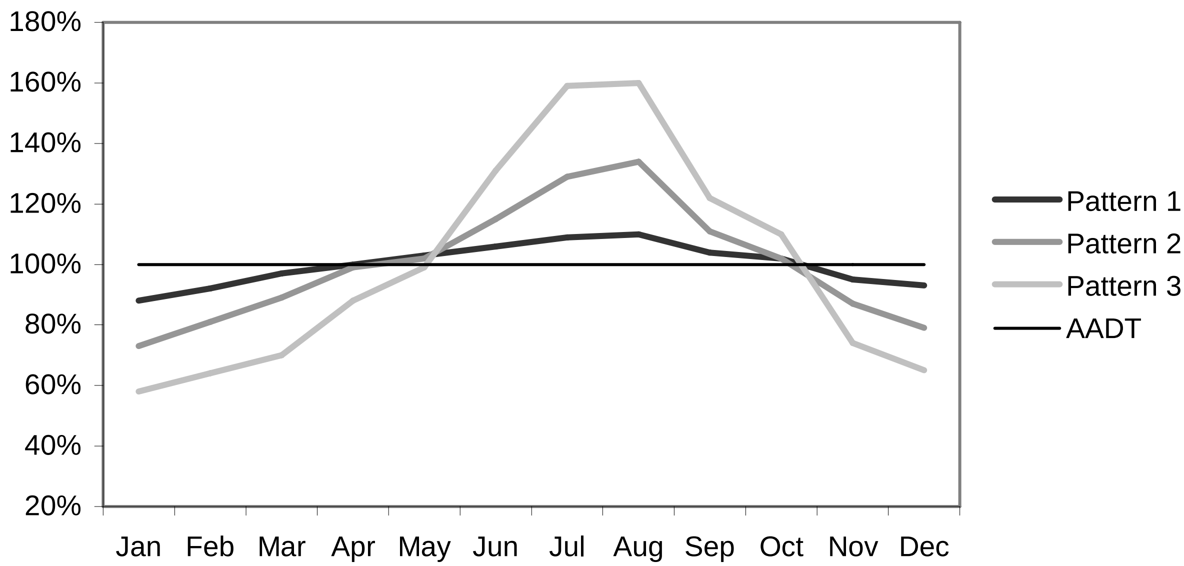
WSDOT conducts its own coverage count program with a three-year count cycle. It has also established the policy that, whenever possible, short duration mechanical counts will be conducted continuously from noon on Monday to noon on Friday, excluding days impacted by holiday traffic, with equipment checked in the field each day for proper functioning. The goal is to capture 72 hours of valid weekday data, with 48 hours considered a minimum. Although counting over entire weeklong periods would theoretically result in average daily traffic figures that were not influenced by day of week variation, consistently performing such counts is effectively precluded by equipment limitations and other reasons noted above. As these considerations necessitate a standard count duration of less than one full week, the period from noon on Monday to noon on Friday was chosen since it is characterized by relatively consistent traffic volume patterns. Because of this, reasonably accurate average weekday traffic volumes can usually be produced even if only 48 hours of data is collected. These average volumes are then factored to compensate for the bias introduced through the exclusion of weekend data.

Seasonal Variations

The seasons of the year have a systematic effect on traffic flow. Traffic is typically depressed below average in the winter months, and elevated above average in the summer. Mid-August is generally the time of peak travel, and mid-January is commonly near the lowest period of flow. Some locations have a harvest influence in early Autumn.

The graph below displays Monthly Average Daily Traffic (MADT) as a percentage of AADT for three typical seasonal traffic patterns found on the state highway system. Pattern 1 reflects the normally modest seasonal curve of urban and urbanized areas. Pattern 2, with a stronger seasonal curve, reflects non-urbanized rural areas lacking a significant recreational traffic influence. Pattern 3 reflects rural central mountain locations heavily affected by summer recreational travel.

Typical Seasonal Variation of Traffic Volumes
MADT as Percentage of AADT



This graph illustrates the need to mathematically adjust short duration count data in relation to seasonal variation if the data is to provide an estimate of AADT that is not strongly influenced by the time of year the source count was conducted. This requires multiplying the weekly average daily traffic figure from a count by a factor representing the ratio of AADT over the weekly average daily traffic of the period covered by the count. In mathematical terms the factor is expressed as:

SF = AADT / weekly average daily traffic

Where SF = seasonal factor

As with day of week factors, the numerator of this fraction will be unknown for the short count location where factoring is required. Therefore seasonal factors will need to be calculated for those locations where data have been collected over an entire year and then applied to short counts conducted on roadway segments with similar characteristics.

It is a common practice to calculate seasonal factors for each month of the year and then apply the factor for a given month to short counts conducted within that month. In this case, the factor is calculated as follows:

SF = AADT / (total monthly traffic / number of days in the month)

Because traffic volumes do change over the course of a month, seasonal factors calculated in this fashion are somewhat less precise than week-specific factors. However, monthly seasonal factors do have several advantages, including the fact that it is less time consuming to calculate and apply them than week-specific factors.

Axle Correction

Short duration counts often do not count vehicles, but are restricted to a tally of axle passages. Because of this, factors representing the ratio of vehicles to axles must be computed and applied to data limited to axle information in order to generate reasonably accurate estimates of vehicle volume.

The source data for computation of an axle correction factor comes from classification counts that capture both the number of vehicles (units) and the number of axles passing a count location. The process of computing an axle correction factor generally begins with the division of the total number of axles counted by two, in order to arrive at the "two-axle equivalent" volume. The next step is to divide the total number of vehicles counted during the same period by the total number of two-axle equivalents. This factor can then be used as a multiplier that, when applied to a two-axle equivalent volume collected at a location with similar characteristics, will produce a relatively accurate estimate of unit volume.

A simple example of the computation of an axle correction factor is shown below.

100	cars at	2 axles each =	200 axles
10	trucks at	3 axles each =	30 axles
5	trucks at	5 axles each =	25 axles
115	vehicles with		255 axles

Two-axle equivalent volume = 255 axles / 2 = 127.5

Axle correction factor = 115 vehicles / 127.5 two-axle equivalents = .90

Axle correction factor (ACF) = .90

The axle correction factor calculated above is fairly typical of many urban areas around industrial locations or rural areas of light to medium trucking activity. This factor is not however representative of locations where large truck traffic represents other than a moderate proportion of the traffic stream. For example, some sections of rural interstate carry high percentages of five axle and larger trucks, resulting in factors of .70 or less.

Axle correction can never be ignored when counting traffic by number of axle passages. Although in urban areas away from arterials the factor can approach 1.00, and the impact of applying a factor may be insignificant, each count location should be evaluated individually before the decision to forgo the application of an axle correction factor is made.

Appendix Three contains a table of axle correction factors by functional class of highway. These may be used when better information is not available. However, factors generated from local data should be considered of superior validity if they are from a representative sample and not skewed by special events such as harvest hauling or the presence of construction vehicles making many round trips over the same section of roadway.

Factoring Short Count Data to an AADT

As discussed, if short duration counts are to produce accurate estimations of AADT then factors must be applied to compensate for temporal variations in the traffic stream and the limitations of count equipment. Annual Average Daily Traffic should therefore be computed from short duration count data as follows:

Estimated AADT = SF * WF * (ACF * ADT)

Where: SF = seasonal factor
WF = day of week factor
ACF = axle correction factor
ADT = average daily traffic from short count

If ADT is expressed in terms of unit volume as opposed to two-axle equivalent volume, then ACF is removed from the computation. If a count is inclusive of all days of the week, then WF is removed from the calculation.

To compensate for both seasonal and day of week variation, WSDOT uses data from PTRs to obtain monthly average weekday traffic to annual average daily traffic conversion factors. Each factor represents the AADT recorded by a PTR divided by the average weekday traffic (AWDT) of that PTR for a given month. These are applied to average weekday traffic volumes from short duration counts through the following formula:

Estimated AADT = SWF * (ACF * AWDT)

Where: SWF = combined seasonal and day of week factor
ACF = axle correction factor
AWDT = average weekday traffic from short count

Again, ACF is removed from the equation if AWDT is expressed in terms of unit volume as opposed to two-axle equivalent volume.

Appendix Four provides average AWDT to AADT conversion factors produced from groups of PTRs with similar seasonal traffic volume trends and definable commonalities in relation to functional classification of roadway, geographic area and/or traffic features. These may be used by local agencies when factors specific to the local area are unavailable. However, it is important to note that seasonal variations come in a wide variety of patterns. Routes used almost exclusively for warm-weather recreational travel will display an even greater summer peak than presented by Pattern 3 in the graph above. A route that is strongly influenced by winter recreational activity, such as one leading to a ski resort, can actually display peak periods in the winter months. Judgment and thought should be exercised in the application of seasonal factors to ensure that the characteristics of the roadway where a count to be factored was conducted match the defining features of the factor group being used.

Short Count Equipment

The market for quality traffic data collection equipment has resulted in a number of vendors that have developed various traffic counters and an array of accompanying sensors. This allows professionals responsible for the administration of traffic counting programs to determine what their data needs are and purchase accordingly. Traffic counters today will collect volume and speed data, and are often capable of recording vehicle classification as well. Several manufactures provide portable traffic counters that will also monitor and record truck wheel, axle, and gross vehicle weights. These systems are lightweight, portable slow-speed and static truck weighing scales that can be transported in the trunk of a car or the back of a truck.

Of course, in deciding upon what equipment to purchase, consideration should be given not only to the type of data that can be collected by a product, but also to the product's cost versus its performance, durability and ease of use. This cost-benefit analysis should take into account such issues as the type of power source the counter uses (e.g., long-term batteries, solar panels), whether or not the counter provides a visual display of the data as it is being collected, and the time required setting up the counter in the field.

The following discussion provides a general overview of portable counters and sensors, as well as the types of data that can be collected with this equipment. In addition, because all or part of a short-count program can be conducted by moving one or more portable counters between a larger number of locations with permanently installed sensors, those types of sensors suited to this application are also addressed. The discussion is intended to help inform the purchasing decisions of local traffic counting programs.

Types of Count Data

As noted above, there are a number of different types of data that can be collected using standard electronic traffic counting equipment. These include:

Volume. Vehicle and axle volume data are by far the most commonly collected data types. This data is usually collected using standard road tubes (axle volume) or permanently installed inductive loops (vehicle volume) connected to an electronic counter. Older electronic counters store this data in programmable time increments ranging from one minute to 24 hours. In contrast, counters that employ newer technology are capable of being programmed to store volume data on a per vehicle basis. This data can then be summarized at whatever interval is needed, using software provided by the manufacturer.

Classification. Vehicle classification data is probably the next most common type collected. When using road tubes, collection of this data requires the setting of two sensors in order for vehicle speed to be determined. Once the speed is determined, internal software can analyze the timing between axle hits to establish axle spacing and thus vehicle classification. Permanent installation of two axle detection sensors, such as dynax or piezo sensors, allows for vehicles to be classified in the same fashion. However, a permanent installation composed of sensors that not only count axles but also determine vehicle presence (e.g., two inductive loops and a piezo sensor) often produce a higher degree of accuracy.

Various classification schemes are in use. Most equipment capable of collecting classification data allow the user to define how vehicles are classified or use a classification scheme preprogrammed into the counter software. The most familiar classification scheme consists of classifying vehicles as automobiles, single-unit trucks, double-unit trucks, or triple-unit trucks. Other schemes break these four categories into additional subdivisions, separating automobiles into smaller groupings (such as motorcycles, cars, pickups and vans) and further dividing the truck categories. The most well known of these more refined classification systems is the one employed by FHWA. This system breaks down vehicles into 13 different classes. However, since no mechanical vehicle classification equipment is perfect, many states have included an additional 14th class used for unknown vehicles. Other states have included additional classes for their own purposes, such as monitoring specific types of vehicles in which they have a special interest. A detailed description of the FHWA classification scheme is provided in Appendix Six.

Speed. The third most common type of data collected is speed data. It is used for many different types of studies, such as gasoline consumption, 85th percentile speed determination for design studies, and various types of environmental studies (including noise and air quality). Any electronic counter capable of classifying vehicles is also capable of collecting speed data. Again, two sensors are usually required to collect speed information. However, it is possible to collect generalized speed data using a single inductive loop if average vehicle length is known.

Weight. Truck weight data has gained importance as a planning tool since the advent of Weigh-In-Motion data collection equipment. The truck weight data collected by such equipment is an integral component of various nationally mandated programs, such as the Strategic Highway Research Program, that have been implemented with a primary goal of collecting pavement longevity information for use in pavement maintenance and design. Recently, significant advances in software and sensor equipment have dramatically improved the accuracy of WIM equipment. These systems are very sophisticated and currently very expensive. However, costs of these systems are expected to decrease as the technology becomes more available.

These systems are capable of tracking individual vehicles and providing classification, single and tandem axle weights, vehicle length, speed, Equivalent Single Axle Loads (ESALs), gross weight, and other user programmable items. Included software programs allow for manipulation of the data in various ways and provide standard and user defined reports.

Gap and Headway. Data on the distance separating vehicles is also gaining importance in the monitoring of roadway safety. The distance between vehicles can be used to identify aggressive driving behaviors and target subsequent enforcement campaigns. Most of today’s counters can collect this data.

Occupancy. The ability to determine if a vehicle is within the detection zone of a sensor and how long it has been in that zone is becoming increasingly important as counters are used for traffic flow estimations and travel times. Most counters today, if connected to presence detectors such as inductive loops, can capture vehicle occupancy data.

Types of Counters Available

A number of different traffic counters are available. Most manufacturers offer various options, such as type of sensor that can be used, and various programs that will collect volume, speed, classification, weight, and gap and headway information, or any desirable combination of these traffic parameters. Basic computerized electronic counters can be purchased for around $900, although prices increase in relation to functionality. The most expensive counters (about $12,000) will do everything, including weigh vehicles and allow automated retrieval of field data via modem. Sensors represent an additional cost, with price depending upon the type of sensor chosen.

The following is a discussion of the traffic counters currently being used by WSDOT planning and regional staff for their collection programs:

Diamond Traffic Products Counters (Unicorn, Pegasus, Etc.). WSDOT planning staff currently use the Unicorn and Pheonix Counter/Classifiers. These devices can be programmed using an onboard keyboard and display, or by connecting a laptop or desktop personal computer. Using pneumatic tube sensors, they can collect volume data on up to four lanes of traffic or classification data on up to two lanes.

Diamond Traffic Products also produces the Apollo Counter/Classifier, which is tailored specifically for cities and counties. The counter collects data at the individual-vehicle level, requires minimal set up time in the field, and is equipped with a complete LCD display so that operators can verify the accuracy of data as it is being collected. Once per-vehicle data is downloaded, manufacturer software also allows for a variety of pre-set or user-defined reports to be generated.

Diamond also produces the Sprite, Traffic Tally and Pegasus series of volume counters. The latter is used by WSDOT planning staff. It can collect data on up to four lanes of traffic, and can be programmed using an onboard keyboard and display, or by connecting a laptop or desktop personal computer.

Timemark Incorporated (Delta III). Several of WSDOT's regional traffic counting programs are using the Timemark Delta III portable road tube classifiers. These counters are designed to collect per-vehicle data on multi-lane, high volume roadways. Manufacturer software allows for a variety of reports to be produced from this data. Timemark also makes a Gamma traffic counter, which is a lower cost, easy-to-use raw data counter capable of providing volume, speed, axle classification, gap and other studies.

International Road Dynamics (TCC540, 1068). WSDOT planning staff also use the TCC540 and 1068 counters at permanent traffic recorder sites. Both counters provide the same functionality as the Diamond Phoenix counters, while the 1068 can also collect Weigh in Motion data.

Data Storage and Retrieval

Computerized traffic counters traditionally stored data in one of two ways. Some stored data in an internal memory for later downloading to a personal computer, while others were designed to write to removable data storage devices such as PCMCIA cards. The current generation of counters writes to internal memory, but allows the data to be downloaded to various types of hardware (e.g., personal computers, BlackBerries, Diamond Traffic Products' Data Hog).

When counters lacking removable data storage devices are used, it is often advantageous to provide field personnel with laptop computers or other devices that can be used for temporary storage of data downloaded in the field. The device can then be brought back to the office and the data transferred to the computer used for data processing. This precludes the need to bring large, heavy counters back to the office in order to process data, which not only saves space but also allows the counters to be immediately reused in the field.

Types of Sensors

In spite of all the major advancements made in electronic technology over the past decade, the technology used to detect vehicles or axles on the highway has not significantly changed. The most reliable and commonly used detection device is still the pneumatic road tube. This and other sensor types are discussed below.

Pneumatic Road Tube (Round). Used to detect the passing of axles, this sensor is an inexpensive round rubber tube or hose that is attached to a counter. A pulse of air is initiated upon wheel contact, which activates a solid-state air switch within the counter housing causing an electrical current to be registered as a single axle. Usually, two activations are recorded as a single two-axle equivalent unit.

These tubes are most efficient when used to count traffic traveling at moderate to high speeds. Their major drawback is that vehicles traveling under 25 miles per hour may not have an energy level sufficient to cause detection by most counters. As a result, they sometimes perform poorly during stop and go traffic conditions. Field personnel must take this limitation into consideration when determining the proper location for placing pneumatic tubes.

Pneumatic Road Tubes (D). This sensor is similar to the round pneumatic tube except that it is shaped like the letter D or a half circle. This shape is intended to reduce the tendency of tubes to roll or drift forward as a vehicle passes over them, and therefore produce a more accurate count than would be achieved with round tubes. The drawback of these tubes is that they are thicker than the round type, resulting in weaker air pulses at low traffic speeds, and therefore less accurate counts under such conditions. For this reason, WSDOT planning staff no longer use D tubes, but instead employ round tubes adhered to the roadway using bituthene tape in order to control drift.

Inductive Loops. Inductive loops are used to detect the passing of vehicles. They have an advantage over road tubes in that they allow for counting at slower speeds and more accurately count volume at higher traffic densities. Their major limitation is their relatively high cost. Non-reusable portable loops are available for purchase off the shelf for around $200, although reusable inductive loops can easily be constructed with $30 to $40 in supplies.

Dynax Sensor. Dynax is best suited for use at permanent volume or classification counting installations, but portable units are also available. Their major limitation is that they are relatively expensive, at around $300 each.

Piezo Sensor. Piezos are devices that utilize the piezo electric phenomenon to sense vehicle axles. When a piezo cable is compressed, it generates a voltage internally. The voltage is measured and used to register the passing of an axle. On higher grade traffic counters, the magnitude of this voltage can be measured electronically to determine the weight of the passing axle. Less sophisticated electronics can be applied to piezos to measure speeds, count volume, and classify vehicles.

Portable piezos are generally not weight grade. Prices for these non-weight grade sensors start at around $250 per unit, although if classification or speed data is desired two sensors are necessary for each lane. Class 1 piezos, which are of a grade capable of weighing vehicles in motion, are currently priced starting at about $700.

Tape Switch. This sensor is a pressure sensitive device containing a conductive pair of wires separated by a compressible material. When hit by a vehicle tire, the tape compresses bringing the two conductors in contact with each other, causing a contact closure that is interpreted as an axle hit by the traffic counter. The price is around $60 for an eight-foot length of tape. They are most useful for counting volumes at locations where road tubes cannot be placed or on structures where placement of inductive loops is not feasible.

Magnetometer. Magnetometers are not commonly used in traffic counting, but they do provide certain advantages over other types of sensors under certain conditions. Magnetometers are most suitable for counting vehicles on metal bridges. Since they measure disturbances in the earths magnetic field, they are unaffected by the metallic elements in bridge structures. Unlike inductive loops, magnetometers are not affected by the metal in reinforced concrete or bridge structures. The difficulty is in their installation. Access may be difficult. However, magnetometers do not have to be embedded in the pavement. They can simply be attached externally to the underside of the concrete highway slab on structures and connected to the counting unit.

Microwave. Microwave sensors are mounted next to the road and pointed across the lanes of travel. Even though they are unsuited for accurately classifying vehicles, they are very attractive for use in urban and other high-volume traffic areas because they are non-intrusive (i.e., set-up and maintenance can be performed without entering the traffic-way). However, their accuracy in collecting vehicle volume data is poor on multi-lane roadways where large vehicles make up more than a nominal percentage of the traffic stream.

Infrared. Infrared sensors are also non-intrusive, and can be used to collect volume, speed, classification, gap and headway data. They do not work well on roads with a large crown and their cost can be prohibitive. However, WSDOT planning staff's testing of this technology indicates that it is superior to microwaves in functionality and accuracy.

Trends in New Counting Equipment

Trends in the development of traffic counting equipment seem to be in the direction of counters that will do more things with higher levels of accuracy. These new counters will keep track of individual axles; time stamping each axle and storing this data in memory. Data will be loaded to a personal computer and software applied to the individual axle data. Reports pertaining to volume, speeds, classification or any combination of these can then be developed using software programs. It is likely that these software programs will have built in algorithms that will automatically modify the data processing methodology based on traffic conditions that occurred during each count. For example, if an accident occurred during the count, traffic conditions would be different after the accident occurred. These algorithms should be able to sense these changes in the collected data and adjust the headway, gap or other parameters to provide the most accurate estimate of the traffic volumes.

Tips on Setting Portable Counters with Road Tubes

When setting counters with pneumatic tubes, one must take great care to place them in the proper location. Tubes should be set an adequate distance from traffic signals or stop signs, as they do not function well in very slow or stop and go traffic. In addition, areas with numerous driveways should be avoided. Traffic turning out of a driveway will cross nearby road tubes at an angle, often resulting in four individual axle hits on the tube by a single two-axle vehicle.

The total length of a road tube should be no less than 30 feet and no greater than 60 feet, with optimal performance achieved from tubes of approximately 50 feet. If a tube is too short, inaccurate counts can result due to reflecting air pulses from the far end of the tube. If a tube is too long, vehicles impacting near the end of the tube may not register due to a weak air pulse.

To set a counter with a pneumatic tube sensor, first chain and lock the counter to a signpost, telephone pole or other fixed object on the shoulder of the road in order to prevent theft. Then lay the tube across the lanes to be counted. Fasten the far end of the tube to the surface using one-eighth inch nylon cord tied around the tube and attached to either 10-inch spikes driven into the shoulder or PK nails driven into the pavement. In a similar fashion, attach the tube to the shoulder of the roadway near the counter after stretching the tube about six inches in order to take out the slack. (Note that the tube should not be stretched too tightly as this will cut off the air pulse to the counter.) In attaching the tube at these two points, care should be taken to ensure that it is set at either a 90-degree angle to the traffic or, if the tube is collecting data for only one direction of travel, angled slightly into the oncoming traffic. At this point the tube can be attached to the counter and the equipment checked for accurate functioning.

Road tubes require periodic maintenance. The interior of the tube must be kept clean and free of water and dirt to ensure proper operation and prevent failure of the counter's air switch. The best method of cleaning is by passing compressed air through the tube.

Maintaining Accuracy of the Equipment

Properly functioning equipment is essential to the accuracy necessary for high quality traffic data. All traffic counting and classifying equipment should be tested for accurate functioning when it is first purchased. The equipment should also be inspected regularly during each field setting. Any time a major malfunction or accuracy problem occurs, or when the collected data appears to be suspicious, the equipment should be examined and repaired or replaced. In addition, the FHWA recommends that each counter be rigorously retested every three years.

The results of all equipment testing should be documented and placed in files for later retrieval and comparison with future tests.

Testing New Equipment

It is always best to have the manufacturer provide a demonstration of their merchandise and then perform some independent tests to determine the dependability of the equipment before purchasing. Testing should include getting the data in a format that will interface with your system or software.

The initial acceptance test of short duration count equipment should be rigorous. The type of test to be conducted depends on the capabilities of the new counter. If the counter is capable of vehicle classification, acceptance testing should be based at minimum on the FHWA's 13-bin classification scheme. If the counter is only capable of measuring volumes, tests should be based on either two-axle equivalent volumes (in the case of axle detection equipment such as air tubes) or unit volumes (in the case of vehicle presence detection equipment such as inductive loops). The FHWA suggests that counters collect volume data accurate to within 10%, and equipment capable of vehicle classification should classify 90% of all vehicles accurately.

Usually, new equipment is purchased under a set of performance specifications. In this case, tests should be designed to ensure that the equipment meets these specifications. Accuracy testing of new counting/classifying equipment should be carried out per the procedures set forth in the original Request for Proposal (RFP) or specifications. If acceptance testing specifications are not included in the RFP, then one of the following two methods should be used:

- The preferred method is to check the accuracy by comparing the results of at least one manual count taken at the same time the new counter is in operation. The manual count should be taken for at least four hours on a roadway where the traffic volume is high enough to collect an adequate sample (at least 100 trucks). If the equipment being tested cannot classify, only a manual volume count will be taken. If the equipment is capable of classifying, a manual classification count will provide the basis for comparison.

- The alternate method is to check the accuracy by comparing the results of at least one mechanical count against the new counter. The count period should be for a minimum duration of four hours. The accuracy of the mechanical counter used to make the comparison should be known and well documented. If the new counter is capable of classifying, then the mechanical count will be a classification count.

Continuous Field Check

Each time a counter is set, it should be checked for proper operation and accuracy. This may be accomplished by conducting a short manual count and comparing the results to those given by the mechanical counter. This count should last for five minutes or the passing of 100 vehicles, whichever comes first. If the counter is set for classification, comparisons should be based on a manual classification count. If the counter is set to record volume only, comparisons should be based on either two-axle equivalent volumes (in the case of axle detection equipment) or unit volumes (in the case of vehicle presence detection equipment).

For as long as the counter is set out at the site, every time the counter is field checked an additional short manual count should be made and the results again recorded. If at any time the accuracy of the counter is suspect, the sensors should first be checked. If these are not operating properly, they must be replaced. Then the manual count check can be continued until it is determined whether or not the counter is functioning properly. If the counter is found to be malfunctioning, it must be replaced immediately and the problem documented. The malfunctioning counter can then be repaired.

Three Year Cycle Testing

All counting equipment should be rigorously retested once every three years, with one third of all counters in current use tested each year. This testing should be performed and documented using the procedures described above under Testing New Equipment.

A schedule for retesting should be developed and maintained. If a piece of equipment has been tested and/or repaired for other purposes within the last three years, and is known to be functioning properly, retesting can be delayed until a three year period has elapsed.

Documentation and Retention of Test Results

All testing of equipment, and any problems discovered, should be documented for later review and comparison with other test results or collected data. It is suggested that three types of documentation be maintained:

1. A file containing data from the initial acceptance testing of equipment, the three-year cycle testing, and other testing due to the detection of operational problems. Information to be filed includes data from the counter, data from manual counts conducted for comparison, and the results of those comparisons.

2. A “counter problem record book”, where information regarding counter malfunctions and other problems is documented.
3. Field sheets that record information from the continuous field checks and other count-specific information needed by office personnel responsible for processing count data. Each sheet should be stored with a copy of the count data and other pertinent information related to the traffic count.

APPENDICES

Adjusted Traffic Count

A base traffic count that has had data adjusted by application of axle, seasonal, day of week or other defined factors.

Annual Average Daily Traffic (AADT)

The estimated average daily traffic over the period of one year.

Automatic Traffic Recorder (ATR)

A device that records the continuous passage of vehicles across a section of road.

Average Daily Traffic (ADT)

The estimated total traffic volume passing a point or on a road segment during a given time period (from one day to one year), divided by the number of days in that time period.

Average Weekday Traffic (AWDT)

The estimated total weekday traffic volume passing a point or on a road segment during a given time period (from one day to one year), divided by the number of weekdays in that time period. For this calculation, "weekday" is often defined exclusive of Fridays.

Average Weekend-day Traffic (AWEDT)

The estimated total weekend-day traffic volume passing a point or on a road segment during a given time period (from one day to one year), divided by the number of week-end days in that time period.

Axle Correction Factor

A factor used to estimate vehicle volume from base two-axle equivalent volume data by adjusting for the incidence of vehicles within the traffic stream having more than two axles.

Base Traffic Count

A traffic count that has not had data adjusted by application of axle, seasonal, day of week or other defined factors.

Base Traffic Data

The unedited and unadjusted measurements of traffic characteristics, including two-axle equivalent volume, vehicle volume, vehicle classification, vehicle speed, vehicle weight, and axle weight.

Continuous Traffic Count

A traffic count with a count period of an entire year, conducted in order to provide generalizable statistics required for highway design (design hour factors, truck factors, et cetera) and/or factors for adjusting short duration base traffic counts (seasonal factors, day of week factors, et cetera).

Count Period

The beginning and ending date and time of traffic characteristic measurement.

Coverage Count

A traffic count conducted wholly or in part to meet the requirement for system-level estimates of traffic characteristics. The count is typically a short duration traffic count, and may collect one or more types of base traffic data.

Data Obsolescence Count

A traffic count conducted as part of a program to provide more thorough traffic data for a roadway system than is produced through coverage counts. The count is typically a short duration traffic count, and may collect one or more types of base traffic data.

Day of Week Factor

A factor used to adjust base traffic count data in order to compensate for travel behavior fluctuations in relation to day of week.

Design Hour Volume (DHV)

The hourly traffic volume used in the design of highways, usually represented by the 30^{th} highest hourly volume of the future year chosen for design.

Factor

A quotient calculated for the purpose of multiplication by a Base Traffic Count or Adjusted Traffic Count in order to compensate for temporal variation in traffic volumes, or multiplication by a Base Traffic Count in order to compensate for the incidence of vehicles with more than two axles in the traffic stream.

Functional Classification

The grouping of streets and highways into classes, or systems, according to the character of service they are intended to provide. The recognition that individual roads do not serve travel independently and most travel involves movement through a network or roads is basic to functional classification.

Growth Factor

A factor used to estimate annual average daily traffic from the previous year's annual average daily traffic by adjusting for the annual change in the number of vehicles within the traffic stream.

Manual Traffic Count

Measurement of traffic characteristics based on human observation, which may or may not be electronically recorded.

Mechanical Traffic Count

Measurement of traffic characteristics by sensors and electronic recording of the measurements, independent of human observations.

Monthly Average Daily Traffic (MADT)

The estimated average daily traffic over the period of one month.

Monthly Average Weekday Traffic (MAWDT)

The estimated average weekday traffic over the period of one month.

Monthly Average Weekend-day Traffic (MAWEDT)

The estimated average weekend-day traffic over the period of one month.

Peak Hour

The 60-minute interval that contains the largest volume of traffic during a given time period.

Peak Hour Directional Percentage

The peak hour peak direction traffic volume expressed as a percentage of total peak hour traffic volume. Often referred to as the D-factor.

Peak Hour Peak Direction

The direction of travel during the peak hour that contains the highest percentage of traffic.

Peak Hour Percentage

The peak hour traffic volume expressed as a percentage of average daily traffic. Often referred to as the K-factor.

Peak Hour Truck Percentage

The truck volume occurring during the peak hour expressed as a percentage of total peak hour volume. Often referred to as the T-factor.

Permanent Traffic Recorder (PTR)

A traffic counting device that is permanently installed at a roadway location and continuously records the passage of vehicles.

Seasonal Factor

A factor used to adjust base-count data in order to compensate for travel behavior fluctuations in relation to time of year.

Short Duration Traffic Count

A traffic count with a count period of less than one year, usually one week or less.

Truck

Any vehicle with six or more tires.

Two-axle Equivalent Volume

The estimated total traffic volume, in terms of the number of axles in contact with the road divided by two, on a road segment during a given time period.

Vehicle Distance Traveled (Miles or Kilometers)

Weighted average traffic volume on a specific road segment multiplied by the length of the road segment. Usually calculated as average daily or total annual vehicle distance traveled.

Appendix Two WSDOT Permanent Traffic Recorders

The continuous traffic count locations monitored by the Automated Data Collection and Processing Section of the WSDOT Transportation Data Office are listed on the following pages. Statewide and Puget Sound area maps displaying these locations are also included. Upon request, data from any of these sites may be obtained from the Transportation Data Office.

Permanent Traffic Recorder

Station Location and Descriptions

RURAL SITES

ADC SITE	SR	MILE POST	RELATED ROADWAY TYPE	LOCATION DESCRIPTION
B02	12	12.30		W/O MONTE BRADY LOOP ROAD WYE CONN
B03	395	27.20		S/O VINEYARD DRIVE - PASCO
B04	90	82.70		W/O CLE ELUM OFF RAMP
FY01	20	12.88		AT KEYSTONE FERRY LANDING
FY03	21	106.65		AT KELLER FERRY LANDING
OR02	101	0.00		AT OREGON BORDER
OR03	125	0.00		AT OREGON BORDER
OR05	730	0.00		AT OREGON BORDER
OR06	82	132.60		AT OREGON BORDER
P01	2	113.10		W/O RED APPLE ROAD - CASHMERE
P02	2	179.10		E/O J SE – COULEE CITY
P03	97	66.30		S/O PROGRESSIVE ROAD WYE CONN - WAPATO
P05	12	376.98		W/O TUCANNON RIVER BRIDGE - DAYTON
P08	82	48.50		W/O SR 22 - BUENA
P09	82	121.20		W/O COFFIN ROAD - PLYMOUTH
P10	90	218.83		W/O SR 395 I/C - RITZVILLE
P11	97	250.35		N/O COUNTY ROAD NO 1525 - PATEROS
P13	195	6.01		S/O BAUER ROAD NO 9440 - UNIONTOWN
P14	195	22.20		S/O SR 270 - PULLMAN
P15	195	87.70		N/O WASHINGTON ROAD - SPANGLE
P17	221	13.10		S/O SELLARDS ROAD - PROSSER
P18	101	324.80		S/O EAGLE CREEK BRIDGE - LILLIWAUP
P22	97	335.30		S/O OLD HIGHWAY ROAD - OROVILLE
P23	97	286.16		S/O SR 20 - OKANOGAN
P25	21	91.55		N/O PRINCE STREET - WILBUR
P26	395	260.00		N/O COUNTY ROAD - ORIENT
P27	25	97.00		N/O BOSSBURG ROAD - BOSSBURG
P28	2	301.40		S/O NORWOOD ROAD - CHATTAROY
P30	27	77.30		S/O GIBBS ROAD
P33	290	17.66		W/O IDAHO RD

RURAL SITES

ADC SITE	SR	MILE POST	RELATED ROADWAY TYPE	LOCATION DESCRIPTION
P7C	395	93.01		S/O SR 90 I/C
P8	5	44.30		N/O KELSO WEIGH STATION
R001	5	207.76		S/O SR 530 I/C
R008	12	307.90		E/O SR 730 WALLULA SPUR
R014	90	254.23		E/O FISHTRAP ROAD I/C
R019	5	86.32		S/O SR 12 I/C - GRAND MOUND
R020	17	30.37		S/O LEE ROAD - OTHELLO
R023	101	281.15		S/O ORCAS AND HOLLAND DRIVES
R037	20	191.90		W/O RADER ROAD - WINTHROP
R038	2	50.12		E/O NE OLD CASCADE HIGHWAY
R039	90	33.56		W/O 468TH AVE SE I/C - NORTH BEND
R040N	123	3.88		N/O ENTRANCE/EXIT OHANAPECOSH CAMPGROUND
R040W	12	135.10		W/O COAL CREEK BRIDGE
R041	97	13.41		N/O STATE FRONTAGE ROAD
R042	90	136.59		E/O WANAPUM ROAD I/C - VANTAGE
R043	105	31.92		AT ELK RIVER BRIDGE - WESTPORT
R045	5	20.14		S/O SR 503 I/C - WOODLAND
R047E	2	104.84		E/O SR 97 - DRYDEN
R047S	97	178.19		S/O OLD BLEWETT ROAD
R047W	2	103.92		W/O GREEN AND SAUNDERS ROADS - PESHASTIN
R048	82	24.83		E/O SELAH CREEK REST AREA ON RAMP
R054	101	104.55		S/O HENSEL ROAD - HUMPTULIPS
R055	90	180.33		E/O SR 17 I/C - MOSES LAKE
R057	970	6.85		W/O TEANAWAY ROAD
R058	2	80.20		E/O NASON RIDGE ROAD
R061	395	36.24		N/O E ELM ROAD
R063	395	190.29		S/O SR 292 - LOON LAKE
R064	2	250.50		W/O GUNNING ROAD
R066	26	43.06		E/O SR 17 I/C
R067	12	390.66		AT PATAHA CREEK BRIDGE

RURAL SITES

ADC SITE	SR	MILE POST	RELATED ROADWAY TYPE	LOCATION DESCRIPTION
R068	97	293.42		N/O COPPLE ROAD - OMAK
R069	101	254.35		AT WEIGH STATION-PORT ANGELES
R070	395	235.60		S/O PINGSTON ROAD
R073	101	203.93		E/O SR 113/BURNT MOUNTAIN ROAD
R074	101	28.95		N/O SR 4 - NEMAH
R075	12	77.78		E/O KENNEDY ROAD – SALKUM
R076	14	100.64		W/O SR 14 MARYHILL SPUR
R077	14	102.27		W/O MARYHILL ROAD - STONEHENGE
R078	4	55.14		W/O SR 432 AND COAL CREEK ROAD - LONGVIEW
R083	9	32.98		N/O 269TH PLACE NE - BRYANT
R084	97	220.55		N/O BRAYS ROAD - ORONDO
R085	104	13.92		AT HOOD CANAL BRIDGE
R086	82	132.03		S/O SR 14 I/C
R088	16	18.65		N/O SR 302 PURDY SPUR – BURLEY
R089	3	28.68		S/O LAKE FLORA ROAD
R094	5	210.30		AT 236TH ST NE UXING
R095	104	19.48		W/O OLD PORT GAMBLE ROAD WYE CONN
R096	307	2.31		S/O NE GUNDERSON ROAD

RURAL SITES

ADC SITE	SR	MILE POST	RELATED ROADWAY TYPE	LOCATION DESCRIPTION
R100	17	112.25		N/O SR 172
S612	24	43.50		AT COLUMBIA RIVER BRIDGE - VERNITA
S706	20	20.02		E/O RHODODENDRON PARK DRIVE
S803	5	269.41		S/O BIRCH BAY/LYNDEN ROAD I/C
S818E	12	185.62		E/O SR 410 I/C
S818S	12	185.25		S/O SR 410 I/C
S818W	410	116.26		W/O SR 12
S819	411	7.97		S/O SANDY BEND ROAD - LEXINGTON
S820	20	304.60		W/O FAIRGROUNDS ROAD - REPUBLIC
S826	90	23.54		E/O JONES ROAD I/C PRESTON
S838	18	27.62		S/O SR 90 - ECHO GLEN
S840	504	19.43		E/O PRIVATE ROAD 1900 - KID VALLEY
S841E	401	0.01		NE/O SR 101 - MEGLER
S841S	101	0.46		S/O SR 401 - MEGLER
S841W	101	0.47		NW/O SR 401 - MEGLER
S901	90	47.71		AT TINKHAM ROAD UXING
S902	90	52.24		AT SR 906 BRIDGE
S903	90	63.98		AT CABIN CREEK ROAD UXING

URBAN SITES

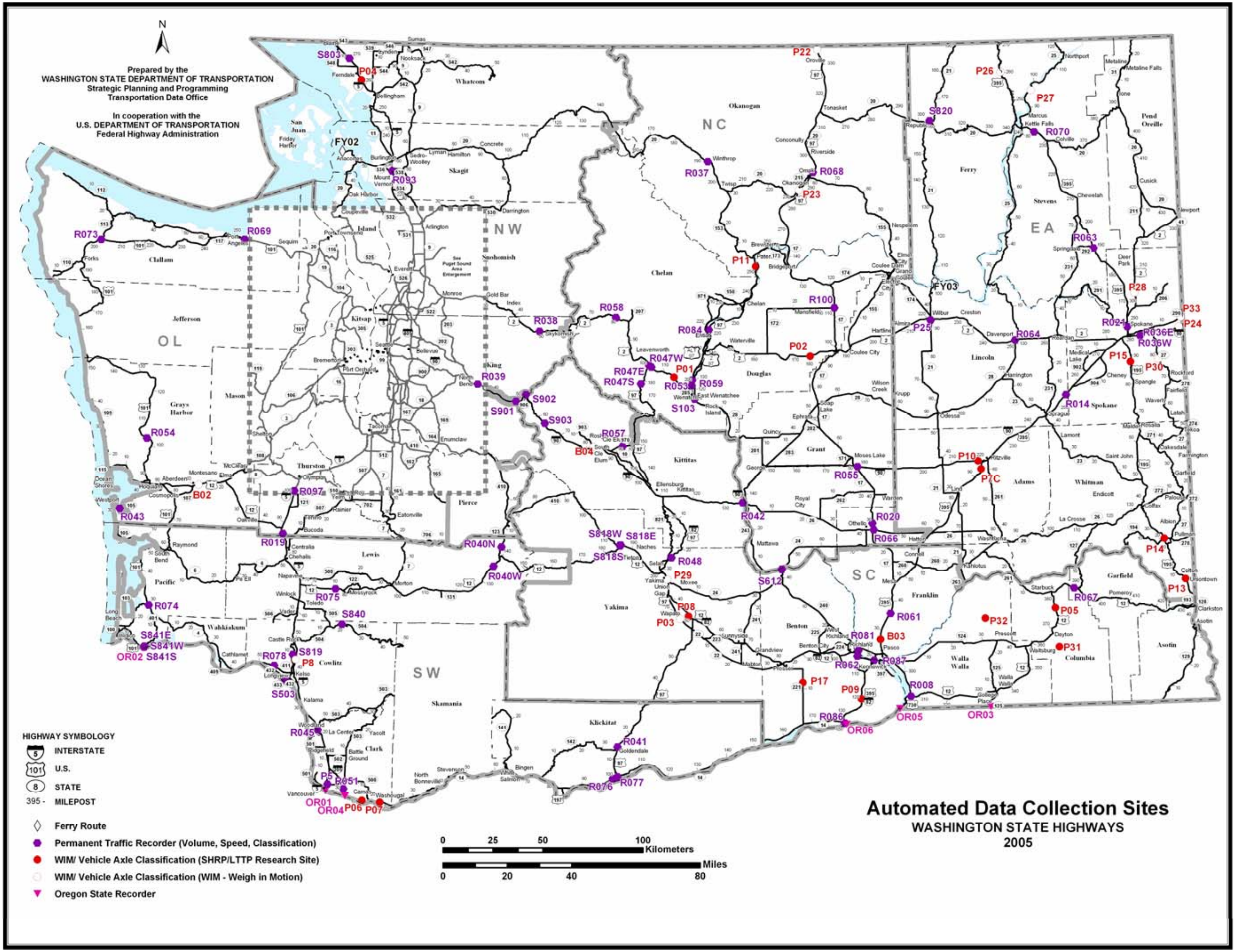
ADC SITE	SR	MILE POST	RELATED ROADWAY TYPE	LOCATION DESCRIPTION
D1	405	9.26		AT 112TH AVENUE SE UXING - BELLEVUE
D10	520	4.00		W/O 76TH AVENUE NE UXING
D11	16	1.10		E/O UNION AVENUE BRIDGE - FIRCREST
D12	18	12.55		AT 180TH AVENUE SE UXING - COVINGTON
D13	518	0.35		E/O SR 509 I/C - SEATAC
D14	509	26.37		N/O SR 518 I/C - BURIEN
D3	512	1.53		W/O SR 7 I/C - PARKLAND
FY02	20	55.67	SPANACRT	AT ANACORTES FERRY LANDING
FY04	104	24.45		AT EDMONDS FERRY LANDING
FY05	160	7.47		AT SOUTHWORTH FERRY LANDING
FY06	304	3.51		AT BREMERTON FERRY LANDING
FY07	305	0.02		AT WINSLOW FERRY LANDING
FY08	525	8.47		AT MUKILTEO FERRY LANDING
FY09	163	3.37		AT POINT DEFIANCE FERRY LANDING
OR01	5	0.00		AT OREGON BORDER
OR04	205	26.59		AT OREGON BORDER
P04	5	261.33		N/O SLATER ROAD I/C - FERNDALE
P06	14	11.90		E/O ALPINE ROAD - CAMAS
P07	14	17.70		E/O 32ND STREET - WASHOUGAL
P1	5	184.48		N/O 164TH STREET SW - EVERETT
P19	522	13.30		W/O SR 9 I/C - WOODINVILLE
P20	18	5.26		E/O SR 164 I/C – AUBURN EAST
P21	9	28.75		N/O HIGHLAND DRIVE - ARLINGTON
P24	90	298.40		W/O IDAHO ROAD I/C
P29	82	34.02		N/O SR 24 - YAKIMA
P3	5	176.72		AT NE 185TH STREET UXING
P4	5	106.70		AT BOULEVARD ROAD UXING - OLYMPIA
P5	5	1.98		S/O SR 500-NE 39TH STREET I/C
P6	167	23.70		N/O S 212TH STREET I/C
R003E	101	361.81		E/O SR 8 - OLYMPIA
R003N	101	361.37		N/O SR 8 - OLYMPIA
R003W	8	20.67		AT SR 101 BRIDGE - OLYMPIA
R017	90	4.22		AT EAST END OF MT BAKER TUNNEL
R021	2	289.79		N/O WALTON AVENUE – DIVISION STREET

URBAN SITES

ADC SITE	SR	MILE POST	RELATED ROADWAY TYPE	LOCATION DESCRIPTION
R034	5	131.18		N/O S 56TH STREET I/C
R036	90	285.23		W/O SPRAGUE AVENUE I/C - SPOKANE
R044	16	8.43		W/O TACOMA NARROWS BRIDGE - TACOMA
R046	5	168.84		S/O NE 45TH STREET I/C
R050	3	44.33		N/O NEWBERRY HILL I/C
R051	205	28.84		N/O MILL PLAIN I/C - VANCOUVER
R052	2	0.26		E/O SR 5 I/C – EVERETT
R053	2	119.77		E/O SR 97 AR I/C - WENATCHEE
R059	97	201.53	AR	N/O OHME GARDEN AND WAREHOUSE ROADS
R060	5	111.01		S/O SR 510 I/C
R062	240	37.53		W/O COLUMBIA PARK TRAIL I/C - RICHLAND
R081	182	6.34		AT COLUMBIA RIVER BRIDGE - PASCO
R082	5	193.29		S/O PACIFIC AVENUE I/C - EVERETT
R087	395	18.58		AT COLUMBIA RIVER BRIDGE
R090	7	58.20		N/O 38TH STREET I/C
R091	5	119.39		N/O DUPONT I/C
R092	5	126.76		S/O SR 512 I/C
R093	5	226.96		N/O SR 536 I/C
R097	5	100.54		S/O TUMWATER BLVD I/C
R098	101	366.69		E/O COOPER POINT RD I/C
R099	5	103.54		N/O DESCHUTES PARKWAY OFF RAMP
R101	99	29.37		N/O SPOKANE ST BRIDGE
R17R	90	4.22	RL090EXP	AT EAST END OF MT BAKER TUNNEL
R49R	5	168.31	RL005EXP	AT E ROANOKE STREET UXING
S103	285	0.21		AT COLUMBIA RIVER BRIDGE - WENATCHEE
S189	5	179.88		N/O 220TH STREET SW I/C
S201	5	155.38		N/O SR 405/SR 518 I/C
S202	5	162.35		N/O CORSON AVENUE I/C
S203	90	10.82		E/O SR 405 I/C
S204	405	13.04		N/O SE 8TH STREET I/C
S205	5	152.82		S/O SR 405/SR 518 I/C
S502	520	0.00		AT SR 520 BEGIN ROUTE
S503	433	0.70		AT COLUMBIA RIVER BRIDGE - LONGVIEW
S533	520	7.93		W/O 148TH AVENUE NE I/C

URBAN SITES

ADC SITE	SR	MILE POST	RELATED ROADWAY TYPE	LOCATION DESCRIPTION
S547	520	12.01		E/O WEST LAKE SAMMAMISH PKWY
S809	5	148.07		S/O SR 516 I/C - MIDWAY
S821	405	6.95		N/O NE 30TH STREET I/C
S822	405	18.71		N/O SR 908 I/C
S824	405	28.99		N/O SR 527 I/C - BOTHELL
S825	90	14.65		W/O SR 900 I/C - ISSAQUAH
S837	5	136.80		S/O SR 99 I/C - FIFE
S839	599	1.40		E/O SR 99 I/C - TUKWILA


Prepared by the
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
Strategic Planning and Programming
Transportation Data Office
In cooperation with the
U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration
N
HIGHWAY SYMBOLOGY
INTERSTATE
U.S.
STATE
395 - MILEPOST
Ferry Route
Permanent Traffic Recorder (Volume, Speed, Classification)
WIM/ Vehicle Axle Classification (SHRP/LTTP Research Site)
WIM/ Vehicle Axle Classification (WIM - Weigh in Motion)
Oregon State Recorder
0 25 50 100 Kilometers
0 20 40 80 Miles
Automated Data Collection Sites
WASHINGTON STATE HIGHWAYS
2005
OL
NW
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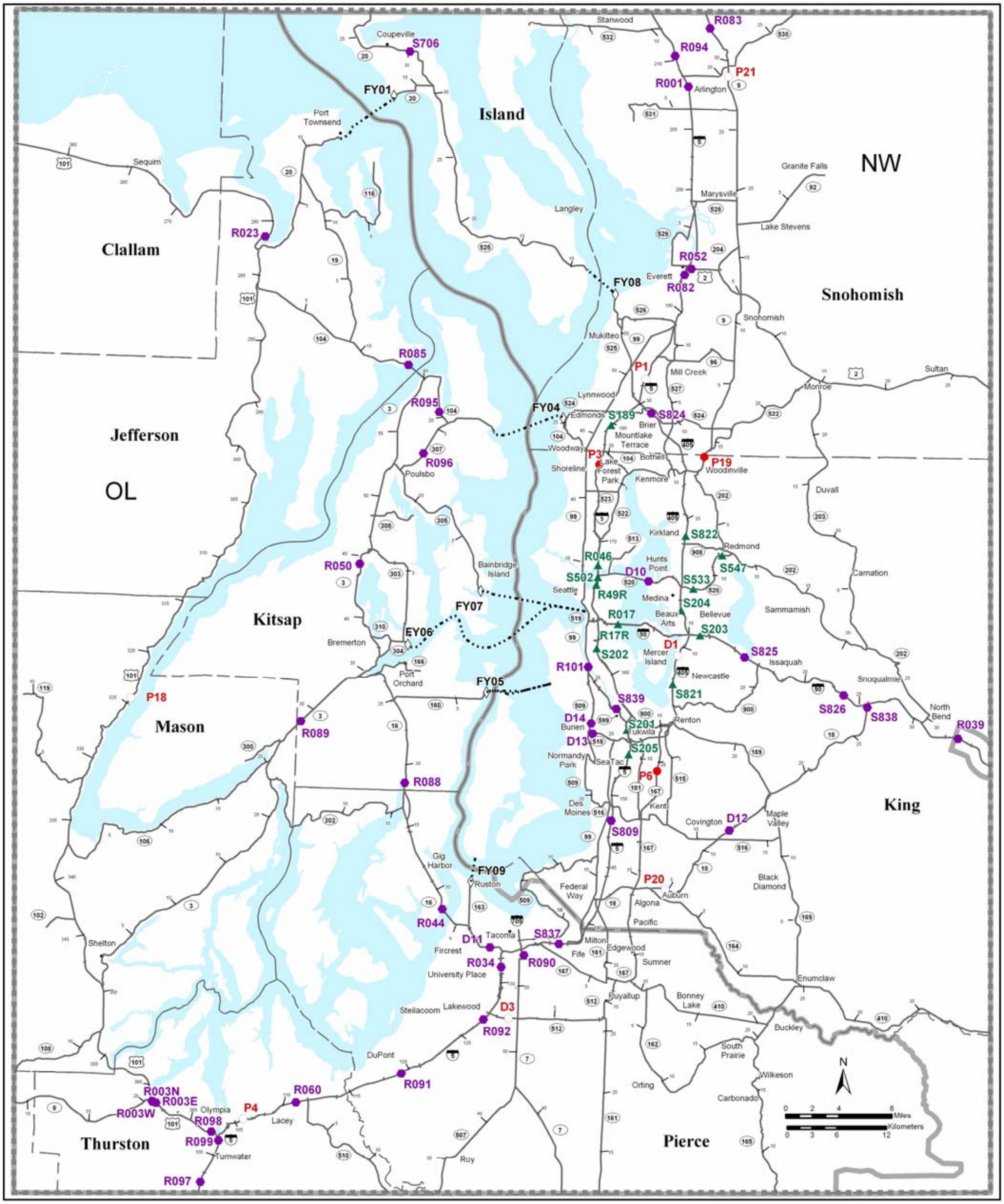

2005
Puget Sound Enlargement

Automated Data Collection Sites

- ◊ Ferry Route
- ▲ Northwest Region Volume Recorder
- ● Permanent Traffic Recorder (Volume, Speed, Classification)
- ● WIM/ Vehicle Axle Classification (SHRP/LTTP Research Site)
- ○ WIM/ Vehicle Axle Classification (WIM - Weigh in Motion)

Axle correction factors can be derived from classification counts that provide both the number of vehicles (units) and the number of axles passing the count site. The factor is calculated by dividing the total number of vehicles by the total number of two-axle equivalents (i.e., the number of axles divided by two). If the local agency has access to vehicle classification counts within its jurisdiction, these should be used to calculate axle correction factors. Two-axle equivalent volume data should be adjusted to estimated vehicle volume data through the application of an axle correction factor derived from one or more counts conducted nearby or at a location with similar characteristics. If an appropriate factor is unavailable, one may be used from the table below, which provides statewide average daily axle correction factors by functional class of highway.

Average Axle Correction Factors by Functional Class of Highway
(Source Data From 2003 Through 2005)

Code	Description	Factor
01	Interstate, Rural	0.83
02	Principal Arterial, Rural	0.91
06	Minor Arterial, Rural	0.92
07	Major Collector, Rural	0.94
08	Minor Collector, Rural	N/A
09	Local, Rural	N/A
11	Interstate, Urban	0.92
12	Other Freeways and Expressways, Urban	0.95
14	Other Principal Arterial, Urban [3]	0.95
16	Minor Arterial, Urban	0.95
17	Collector, Urban	0.96
19	Local, Urban	N/A

[3] Data from functional classes 12 and 14 are combined to generate the factor provided for each.

If a count location can be matched to a functional class for which the table provides a factor, that value should be used. Counts conducted on a functional class 08 or 09 highway should be factored using the value closest to 1.00 provided for a rural functional class. Counts conducted on a functional class 19 highway should be factored using the value closest to 1.00 provided for an urban functional class. The exceptions to these guidelines are that: 1) if a count location, whether urban or rural, exists within an urbanized area as defined by the U.S. Census Bureau then an urban factor should be employed; and 2) if a count location is within a city with a population of less than 10,000, but not within an urbanized area, then a rural factor should usually be used.

Note that because the factors provided in the table above are based on both weekday and weekend source data, discretion is recommended regarding their use when a count to be factored is not representative of all days of the week. The importance of this is illustrated by the table beginning on the next page, which provides 2005 axle correction factors from WSDOT permanent traffic recorders. As can be seen, weekday and weekend factors are often significantly different. It is suggested that local agencies utilize the factor information below to supplement their counting programs whenever applicable.

2005 Axle Correction Factors From WSDOT Permanent Traffic Recorders

Weekday = Average Tues, Wed, and Thurs   Weekend = Average Fri, Sat, and Sun

PTR		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B03	WEEKDAY	0.6773	0.6871	0.6921	0.7055	0.7093	N/A	0.7064	0.6904	0.6776	0.6771	0.6945	0.6849
B03	WEEKEND	0.7937	0.8019	0.8056	0.8130	0.8331	N/A	0.8118	0.7964	0.7846	0.8004	0.8186	0.7843
B04	WEEKDAY	0.6268	0.6505	0.6734	0.6833	0.6944	0.7179	0.7365	0.7269	0.6933	0.6726	0.6654	N/A
B04	WEEKEND	0.8129	0.8276	0.8454	0.8514	0.8724	0.8624	0.8760	0.8758	0.8488	0.8499	0.8151	N/A
D1	WEEKDAY	N/A	0.9492	0.9481	0.9496	0.9484	0.9487	0.9486	0.9460	0.9462	N/A	N/A	N/A
D1	WEEKEND	N/A	0.9769	0.9702	0.9703	0.9714	0.9693	0.9729	0.9658	0.9682	N/A	N/A	N/A
D10	WEEKDAY	0.9853	0.9846	0.9852	0.9853	0.9841	0.9860	0.9847	0.9850	0.9838	0.9837	0.9852	0.9844
D10	WEEKEND	0.9906	0.9909	0.9908	0.9907	0.9906	0.9909	0.9899	0.9896	0.9881	0.9902	0.9906	0.9911
D11	WEEKDAY	N/A	0.9590	0.9574	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D11	WEEKEND	N/A	0.9751	0.9731	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D12	WEEKDAY	0.8440	0.8384	0.8451	0.8470	0.8435	0.8456	0.8469	0.8413	0.8301	0.8332	0.8434	0.8418
D12	WEEKEND	0.9086	0.9061	0.9118	0.9116	0.9146	0.9118	0.9135	0.9101	0.8962	0.9031	0.9002	0.9057
D13	WEEKDAY	0.9626	0.9518	0.9527	0.9689	0.9580	0.9385	0.9420	0.9196	0.9274	0.9415	0.9767	0.9826
D13	WEEKEND	0.9827	0.9688	0.9632	0.9842	0.9772	0.9644	0.9664	0.9513	0.9556	0.9753	0.9843	0.9897
D14	WEEKDAY	0.9817	0.9803	0.9797	0.9843	0.9812	0.9791	0.9776	0.9789	0.9802	0.9827	0.9839	0.9847
D14	WEEKEND	0.9893	0.9859	0.9878	0.9898	0.9884	0.9856	0.9858	0.9863	0.9855	0.9897	0.9902	0.9906
D3	WEEKDAY	0.9265	0.9248	0.9244	0.9218	0.9205	0.9163	0.9178	0.9144	0.9154	N/A	0.9221	0.9205
D3	WEEKEND	0.9580	0.9598	0.9573	0.9534	0.9550	0.9519	0.9555	0.9515	0.9492	N/A	0.9530	0.9571
P01	WEEKDAY	0.9174	0.9184	0.9144	0.9135	0.9126	0.9114	0.9178	0.9154	0.9067	0.8981	0.9110	0.9099
P01	WEEKEND	0.9578	0.9557	0.9560	0.9541	0.9597	0.9510	0.9532	0.9549	0.9416	0.9472	0.9526	0.9541
P02	WEEKDAY	N/A	N/A	N/A	N/A	N/A	0.8579	0.8747	0.8815	0.8745	N/A	N/A	0.8179
P02	WEEKEND	N/A	N/A	N/A	N/A	N/A	0.9419	0.9454	0.9343	0.9555	N/A	N/A	0.9225
P03	WEEKDAY	N/A	N/A	0.9074	0.8958	0.9032	0.9013	0.9066	0.8906	0.8880	0.8922	0.8971	0.9113
P03	WEEKEND	N/A	N/A	0.9496	0.9415	0.9509	0.9447	0.9467	0.9428	0.9323	0.9397	0.9398	0.9495
P04	WEEKDAY	0.9066	0.9051	0.9066	0.9033	0.9038	0.9071	0.9066	0.9099	0.9069	0.9032	0.9052	0.9121
P04	WEEKEND	0.9449	0.9435	0.9463	0.9420	0.9448	0.9418	0.9466	0.9465	0.9433	0.9448	0.9497	0.9489
P05	WEEKDAY	0.7173	0.7400	0.7651	0.7648	0.7665	0.7904	0.7849	0.7669	0.7577	0.7541	0.7767	0.7574
P05	WEEKEND	0.8481	0.8658	0.8774	0.8730	0.8915	0.8878	0.8712	0.8649	0.8600	0.8734	0.8874	0.8544
P06	WEEKDAY	0.9319	0.9292	0.9301	0.9323	0.9299	0.9301	0.9326	0.9305	0.9227	0.9219	0.9320	0.9310
P06	WEEKEND	0.9567	0.9592	0.9600	0.9593	0.9607	0.9602	0.9608	0.9586	0.9528	0.9562	0.9601	0.9619

2005 Axle Correction Factors From WSDOT Permanent Traffic Recorders

Weekday = Average Tues, Wed, and Thurs   Weekend = Average Fri, Sat, and Sun

PTR		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
P07	WEEKDAY	0.8904	0.8874	0.8845	0.8833	0.8844	0.8836	0.8886	0.8849	0.8723	0.8706	0.8814	0.8893
P07	WEEKEND	0.9470	0.9495	0.9449	0.9402	0.9469	0.9485	0.9504	0.9481	0.9414	0.9414	0.9442	0.9524
P08	WEEKDAY	0.8008	0.8046	N/A	0.8045	0.8109	0.8108	0.8172	0.7864	0.7730	0.7768	0.8104	0.7908
P08	WEEKEND	0.8657	0.8768	N/A	0.8751	0.8884	0.8779	0.8844	0.8483	0.8498	0.8468	0.8741	0.8570
P09	WEEKDAY	0.7005	0.7135	0.7233	0.7203	0.7308	N/A	0.7616	0.7465	0.7243	N/A	0.7406	0.7662
P09	WEEKEND	0.8044	0.8094	0.8185	0.8125	0.8345	N/A	0.8422	0.8318	0.8072	N/A	0.8401	0.8243
P1	WEEKDAY	0.9326	0.9321	0.9315	0.9315	0.9310	0.9330	0.9299	0.9292	0.9254	0.9261	0.9278	0.9322
P1	WEEKEND	0.9656	0.9610	0.9618	0.9605	0.9633	0.9604	0.9661	0.9649	0.9556	0.9594	0.9658	0.9731
P10	WEEKDAY	0.6413	0.6675	0.6830	0.6825	N/A	0.7657	0.7516	0.7525	0.7140	0.6827	0.7201	0.6956
P10	WEEKEND	0.7797	0.8130	0.8291	0.8254	N/A	0.8621	0.8657	0.8686	0.8416	0.8311	0.8252	0.8053
P11	WEEKDAY	0.8487	0.8557	0.8472	0.8626	0.8510	0.8676	0.8636	0.8735	N/A	0.8012	0.8503	0.8439
P11	WEEKEND	0.9325	0.9384	0.9259	0.9319	0.9375	0.9367	0.9260	0.9309	N/A	0.8650	0.9167	0.9145
P13	WEEKDAY	0.8224	0.8302	0.8303	0.8316	0.8346	0.8315	0.8256	0.8151	0.8175	0.8177	0.8205	0.8281
P13	WEEKEND	0.8980	0.9053	0.9041	0.9025	0.9078	0.8970	0.8923	0.8818	0.8895	0.9058	0.9069	0.8993
P14	WEEKDAY	0.7483	0.7421	0.7488	0.7546	0.7689	0.7660	0.7749	0.7616	0.7462	0.7497	0.7619	0.7691
P14	WEEKEND	0.8474	0.8539	0.8589	0.8573	0.8736	0.8642	0.8594	0.8549	0.8446	0.8650	0.8571	0.8529
P15	WEEKDAY	0.8858	0.8845	0.8853	0.8850	0.8932	0.8790	0.8802	0.8797	0.8814	0.8815	N/A	0.8864
P15	WEEKEND	0.9351	0.9422	0.9406	0.9373	0.9488	0.9369	0.9326	0.9310	0.9327	0.9420	N/A	0.9413
P17	WEEKDAY	0.5173	0.5275	0.5456	0.5443	0.5438	0.5462	0.5506	0.5358	0.5375	0.5182	0.5356	0.5250
P17	WEEKEND	0.5761	0.5932	0.6030	0.6034	0.6181	0.6136	0.6176	0.5975	0.5923	0.5763	0.5858	0.5734
P18	WEEKDAY	N/A	N/A	0.8524	0.8637	0.8597	0.8744	0.8829	0.8670	0.8596	0.8683	0.8571	0.8441
P18	WEEKEND	N/A	N/A	0.9252	0.9401	0.9553	0.9509	0.9560	0.9514	0.9417	0.9428	0.9423	0.9190
P19	WEEKDAY	0.9410	0.9386	0.9391	0.9302	0.9346	0.9361	0.9357	N/A	N/A	N/A	N/A	N/A
P19	WEEKEND	0.9712	0.9685	0.9697	0.9651	0.9696	0.9668	0.9661	N/A	N/A	N/A	N/A	N/A
P20	WEEKDAY	0.8553	0.8428	0.8554	0.8623	0.8720	0.8758	0.8629	0.8441	0.8329	0.8669	0.8774	0.8863
P20	WEEKEND	0.9259	0.9103	0.9181	0.9223	0.9334	0.9336	0.9305	0.9125	0.9053	0.9293	0.9291	0.9415
P21	WEEKDAY	0.9494	0.9490	0.9515	0.9429	0.9400	0.9401	0.9342	0.9390	0.9303	0.9376	0.9386	0.9391
P21	WEEKEND	0.9758	0.9714	0.9750	0.9704	0.9720	0.9726	0.9695	0.9699	0.9625	0.9720	0.9752	0.9738
P22	WEEKDAY	0.7627	0.7695	N/A	N/A	N/A	N/A	0.8057	0.8170	0.7793	0.7653	0.7826	0.7755
P22	WEEKEND	0.8591	0.8569	N/A	N/A	N/A	N/A	0.8997	0.8981	0.8788	0.8759	0.8824	0.8705

2005 Axle Correction Factors From WSDOT Permanent Traffic Recorders

Weekday = Average Tues, Wed, and Thurs **Weekend = Average Fri, Sat, and Sun**

PTR		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
P23	WEEKDAY	0.8422	0.8383	0.8349	0.8438	0.8424	0.8415	0.8483	0.8408	0.8016	0.8051	0.8612	0.8649
P23	WEEKEND	0.9188	0.9114	0.9082	0.9064	0.9135	0.9101	0.9128	0.9053	0.8706	0.8710	0.9148	0.9213
P24	WEEKDAY	0.9061	0.9046	0.9004	0.8955	0.9020	N/A	0.9105	N/A	0.9013	0.9017	N/A	N/A
P24	WEEKEND	0.9322	0.9336	0.9292	0.9250	0.9312	N/A	0.9344	N/A	0.9302	0.9276	N/A	N/A
P26	WEEKDAY	N/A	N/A	0.7028	0.7076	0.7343	0.7367	0.7829	0.7886	0.7589	0.7655	N/A	0.7427
P26	WEEKEND	N/A	N/A	0.8582	0.8491	0.8837	0.8916	0.9172	0.9145	0.8704	0.8784	N/A	0.8617
P28	WEEKDAY	0.9559	N/A	0.9508	0.9464	0.9424	0.9445	N/A	0.9423	0.9408	0.9427	0.9435	0.9521
P28	WEEKEND	0.9767	N/A	0.9763	0.9707	0.9682	0.9690	N/A	0.9659	0.9674	0.9717	0.9711	0.9761
P29	WEEKDAY	N/A	N/A	0.8535	0.8477	0.8549	0.8545	0.8554	0.8380	0.8234	0.8255	0.8473	0.8459
P29	WEEKEND	N/A	N/A	0.9121	0.9047	0.9205	0.9075	0.9051	0.8938	0.8763	0.8842	0.9107	0.8931
P30	WEEKDAY	0.9665	0.9641	0.9617	0.9597	0.9623	0.9564	0.9481	0.9488	0.9474	0.9528	0.9593	N/A
P30	WEEKEND	0.9868	0.9857	0.9828	0.9792	0.9815	0.9768	0.9763	0.9750	0.9723	0.9792	0.9825	N/A
P33	WEEKDAY	0.8725	N/A	0.8632	0.8548	0.8546	0.8644	0.8648	0.8663	0.8373	0.8428	0.8469	0.8416
P33	WEEKEND	0.9226	N/A	0.9173	0.9087	0.9210	0.9206	0.9263	0.9225	0.8958	0.9075	0.9006	0.9043
P4	WEEKDAY	0.8862	0.8875	0.8859	0.8858	0.8841	N/A	0.8845	0.8835	0.8794	N/A	0.8851	0.8817
P4	WEEKEND	0.9306	0.9307	0.9297	0.9337	0.9302	N/A	0.9364	0.9335	0.9259	N/A	0.9458	0.9431
P6	WEEKDAY	N/A	N/A	N/A	N/A	N/A	N/A	0.9019	0.8865	0.8809	0.9022	0.9232	0.9268
P6	WEEKEND	N/A	N/A	N/A	N/A	N/A	N/A	0.9419	0.9334	0.9266	0.9479	0.9653	0.9598
P7C	WEEKDAY	N/A	N/A	0.6347	N/A	N/A	0.6766	0.6944	0.6886	N/A	N/A	N/A	N/A
P7C	WEEKEND	N/A	N/A	0.7650	N/A	N/A	0.7982	0.8065	0.8062	N/A	N/A	N/A	N/A
P8	WEEKDAY	0.6998	0.7105	0.7129	0.7146	N/A	N/A	N/A	0.7354	0.7110	0.7028	0.7218	0.7185
P8	WEEKEND	0.8331	0.8402	0.8328	0.8520	N/A	N/A	N/A	0.8631	0.8456	0.8441	0.8473	0.8383
R001	WEEKDAY	0.8713	0.8742	0.8748	0.8735	0.8728	0.8761	0.8771	0.8770	0.8673	0.8667	0.8762	0.8775
R001	WEEKEND	0.9312	0.9312	0.9322	0.9288	0.9332	0.9305	0.9322	0.9324	0.9243	0.9301	0.9341	0.9330
R003E	WEEKDAY	0.9397	0.9371	0.9368	0.9333	0.9335	0.9324	0.9345	0.9318	0.9278	0.9315	0.9360	0.9368
R003E	WEEKEND	0.9653	0.9628	0.9631	0.9597	0.9637	0.9599	0.9606	0.9589	0.9545	0.9603	0.9623	0.9632
R003N	WEEKDAY	0.9500	0.9465	0.9454	0.9431	0.9431	0.9428	0.9422	0.9405	0.9373	0.9393	0.9423	0.9428
R003N	WEEKEND	0.9706	0.9665	0.9664	0.9638	0.9672	0.9635	0.9643	0.9620	0.9587	0.9625	0.9642	0.9648
R003W	WEEKDAY	0.9197	0.9194	0.9205	0.9149	0.9155	0.9126	0.9214	0.9168	0.9099	0.9161	0.9236	0.9250
R003W	WEEKEND	0.9565	0.9571	0.9580	0.9534	0.9584	0.9543	0.9553	0.9546	0.9478	0.9567	0.9591	0.9604

2005 Axle Correction Factors From WSDOT Permanent Traffic Recorders

Weekday = Average Tues, Wed, and Thurs Weekend = Average Fri, Sat, and Sun

PTR		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
R008	WEEKDAY	0.8132	0.8168	0.8379	0.8347	0.8473	0.8387	0.7990	0.8080	0.8085	0.8183	0.8301	0.8180
R008	WEEKEND	0.8973	0.8998	0.9141	0.9090	0.9194	0.9104	0.8688	0.8721	0.8791	0.8974	0.9083	0.8943
R014	WEEKDAY	0.6352	0.6538	0.6647	N/A	N/A	0.7118	0.7318	0.7227	0.6822	0.6603	0.6813	0.6650
R014	WEEKEND	0.7687	0.7875	0.8013	N/A	N/A	0.8266	0.8360	0.8346	0.8131	0.7992	0.7978	0.7690
R019	WEEKDAY	0.7399	0.7497	0.7539	0.7519	0.7510	N/A	0.7731	0.7680	0.7498	0.7332	0.7508	0.7566
R019	WEEKEND	0.8544	0.8593	0.8622	0.8585	0.8677	N/A	0.8741	0.8741	0.8551	0.8530	0.8576	0.8579
R020	WEEKDAY	0.7245	0.7236	0.7148	0.7222	0.7357	0.7369	0.7467	0.7138	0.7257	0.7211	0.7308	0.7243
R020	WEEKEND	0.8090	0.8134	0.7976	0.8092	0.8379	0.8257	0.8269	0.7846	0.8047	0.8016	0.8181	0.8080
R023	WEEKDAY	0.8661	0.8717	0.8690	0.8743	0.8803	0.9054	N/A	0.9199	0.8831	0.8752	0.8724	0.8642
R023	WEEKEND	0.9385	0.9406	0.9415	0.9413	0.9539	0.9530	N/A	0.9575	0.9417	0.9453	0.9407	0.9305
R034	WEEKDAY	0.9098	0.9146	0.9114	0.9106	0.9100	0.9092	0.9113	0.9091	0.9069	0.9035	N/A	N/A
R034	WEEKEND	0.9547	0.9505	0.9478	0.9459	0.9489	0.9468	0.9469	0.9436	0.9404	0.9460	N/A	N/A
R037	WEEKDAY	0.9770	0.9817	0.9517	0.9465	0.9454	0.9504	0.9552	0.9562	0.9505	0.9419	0.9602	0.9777
R037	WEEKEND	0.9883	0.9855	0.9771	0.9641	0.9680	0.9690	0.9725	0.9722	0.9675	0.9602	0.9707	0.9815
R038	WEEKDAY	0.8754	0.8725	0.8518	0.8657	0.8779	0.8886	0.9108	0.9076	0.8876	0.8614	0.8925	0.9177
R038	WEEKEND	0.9662	0.9597	0.9569	0.9558	0.9576	0.9551	0.9589	0.9622	0.9512	0.9546	0.9557	0.9666
R039	WEEKDAY	0.6515	0.6677	N/A	0.6929	N/A	N/A	0.7350	N/A	N/A	0.6816	0.6915	0.7029
R039	WEEKEND	0.8504	0.8399	N/A	0.8642	N/A	N/A	0.8779	N/A	N/A	0.8510	0.8381	0.8568
R040W	WEEKDAY	0.7005	0.7032	0.7455	0.7551	0.7528	0.7817	0.8041	0.7811	0.7813	0.7378	0.7951	0.7787
R040W	WEEKEND	0.8976	0.8499	0.8674	0.8800	0.9047	0.8952	0.8982	0.8796	0.8900	0.8602	0.9028	0.8733
R041	WEEKDAY	0.6822	0.7045	0.7058	0.7148	0.7196	0.7285	0.7454	0.7328	0.7141	0.7020	0.7182	0.6955
R041	WEEKEND	0.7976	0.8209	0.8288	0.8237	0.8459	0.8365	0.8533	0.8544	0.8171	0.8117	0.8132	0.7992
R042	WEEKDAY	0.5941	0.6126	0.6463	N/A	N/A	N/A	0.7398	0.7210	0.6842	0.6505	0.6323	0.7066
R042	WEEKEND	0.7697	0.7891	0.8069	N/A	N/A	N/A	0.8721	0.8706	0.8481	0.8210	0.8061	0.8506
R043	WEEKDAY	0.9511	0.9585	0.9608	0.9636	0.9628	0.9527	0.9497	0.9509	0.9575	0.9555	0.9665	0.9629
R043	WEEKEND	0.9728	0.9723	0.9748	0.9726	0.9736	0.9667	0.9621	0.9635	0.9639	0.9767	0.9777	0.9755
R044	WEEKDAY	N/A	N/A	0.9546	0.9542	0.9511	0.9515	0.9534	0.9529	N/A	0.9529	0.9555	0.9563
R044	WEEKEND	N/A	N/A	0.9733	0.9718	0.9721	0.9707	0.9699	0.9711	N/A	0.9722	0.9728	0.9739
R045	WEEKDAY	0.7609	N/A	N/A	N/A	0.7494	0.7571	0.7704	0.7696	0.7667	0.7609	0.7469	N/A
R045	WEEKEND	0.8626	N/A	N/A	N/A	0.8574	0.8557	0.8654	0.8699	0.8649	0.8585	0.8349	N/A

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PTR		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
R047S	WEEKDAY	0.7107	0.7368	0.7472	0.7560	0.7647	0.7814	0.7999	N/A	0.7711	0.7423	0.7250	0.7226
R047S	WEEKEND	0.8684	0.8731	0.8810	0.8809	0.9066	0.8961	0.9067	N/A	0.8869	0.8847	0.8509	0.8632
R047W	WEEKDAY	0.9238	0.9309	0.9301	0.9294	0.9260	0.9232	0.9299	0.9243	0.9127	0.9211	0.9222	0.9257
R047W	WEEKEND	0.9593	0.9618	0.9631	0.9611	0.9631	0.9595	0.9627	0.9607	0.9466	0.9572	0.9536	0.9581
R048	WEEKDAY	0.6845	0.7018	0.7200	0.7234	0.7262	N/A	N/A	N/A	N/A	0.7024	0.7154	0.6987
R048	WEEKEND	0.8001	0.8238	0.8377	0.8348	0.8502	N/A	N/A	N/A	N/A	0.8126	0.8156	0.8046
R050	WEEKDAY	0.9431	0.9445	0.9450	0.9443	0.9429	0.9409	0.9404	0.9402	0.9394	N/A	0.9443	0.9430
R050	WEEKEND	0.9647	0.9641	0.9653	0.9634	0.9639	0.9615	0.9598	0.9615	0.9584	N/A	0.9649	0.9652
R051	WEEKDAY	0.9267	0.9283	0.9259	0.9271	0.9252	0.9274	0.9281	0.9288	0.9247	0.9246	0.9261	0.9280
R051	WEEKEND	0.9532	0.9540	0.9536	0.9522	0.9534	0.9527	0.9527	0.9528	0.9521	0.9473	0.9534	0.9541
R053	WEEKDAY	0.9028	0.8419	0.8763	0.9020	0.9074	0.9194	0.9073	0.9003	0.8795	0.8686	0.8922	0.9024
R053	WEEKEND	0.9441	0.9032	0.9388	0.9436	0.9492	0.9475	0.9385	0.9410	0.9151	0.9134	0.9333	0.9550
R054	WEEKDAY	N/A	0.8211	0.7807	0.7697	0.7742	0.8074	0.8208	0.7965	0.7301	0.7838	0.7641	0.7898
R054	WEEKEND	N/A	0.9286	0.9104	0.8915	0.9102	0.9095	0.9228	0.9092	0.8856	0.9009	0.9029	0.8802
R055	WEEKDAY	0.6676	0.6852	0.7046	0.7022	N/A	N/A	N/A	N/A	N/A	0.6871	N/A	0.7296
R055	WEEKEND	0.7959	0.8141	0.8330	0.8260	N/A	N/A	N/A	N/A	N/A	0.8206	N/A	0.8299
R057	WEEKDAY	0.7620	0.7939	0.7948	0.7962	0.8037	0.8212	0.8420	0.8534	0.8143	0.7826	0.7519	0.7705
R057	WEEKEND	0.9047	0.9105	0.9131	0.9108	0.9272	0.9223	0.9297	0.9359	0.9154	0.9120	0.8775	0.8919
R058	WEEKDAY	0.8249	0.8408	0.8328	0.8529	0.8651	0.8766	0.8987	0.8968	0.8763	0.8508	0.8653	0.8829
R058	WEEKEND	0.9486	0.9474	0.9497	0.9437	0.9523	0.9502	0.9537	0.9559	0.9459	0.9490	0.9396	0.9523
R059	WEEKDAY	0.9617	0.9606	0.9550	N/A	N/A	0.9320	0.9483	0.9473	0.9322	0.9287	0.9495	0.9470
R059	WEEKEND	0.9763	0.9748	0.9737	N/A	N/A	0.9690	0.9724	0.9722	0.9614	0.9636	0.9706	0.9691
R060	WEEKDAY	0.8653	0.8582	0.8531	N/A	0.8425	0.8474	0.8523	0.8517	0.8466	0.8437	0.8491	0.8483
R060	WEEKEND	0.9183	0.9149	0.9124	N/A	0.9110	0.9090	0.9117	0.9128	0.9084	0.9092	0.9057	0.9073
R061	WEEKDAY	0.6552	0.6645	0.6613	0.6621	0.6777	0.6860	N/A	0.6667	0.6575	0.6494	0.6738	0.6701
R061	WEEKEND	0.7751	0.7849	0.7842	0.7825	0.8093	0.8026	N/A	0.7790	0.7720	0.7819	0.8011	0.7764
R062	WEEKDAY	0.9749	0.9752	0.9459	0.9320	0.9447	0.9558	0.9622	0.9630	0.9574	N/A	N/A	N/A
R062	WEEKEND	0.9818	0.9837	0.9651	0.9314	0.9565	0.9743	0.9746	0.9784	0.9805	N/A	N/A	N/A
R063	WEEKDAY	0.8779	0.8787	0.8808	0.8880	0.8875	0.8883	0.9040	0.9048	0.8931	0.8878	0.8875	0.8883
R063	WEEKEND	0.9409	0.9402	0.9384	0.9384	0.9453	0.9459	0.9494	0.9467	0.9397	0.9450	0.9434	0.9378

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PTR		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
R064	WEEKDAY	0.8813	0.8775	0.8811	0.8789	0.8695	0.8785	0.8817	0.8859	0.8759	0.8759	0.8871	0.8837
R064	WEEKEND	0.9313	0.9341	0.9344	0.9266	0.9338	0.9344	0.9326	0.9384	0.9337	0.9347	0.9325	0.9351
R066	WEEKDAY	0.7590	0.7542	0.7631	0.7655	0.8085	0.8057	0.8070	0.8204	0.7943	0.7756	0.7953	0.7888
R066	WEEKEND	0.8832	0.8799	0.8927	0.8860	0.9174	0.8965	0.8945	0.9096	0.9082	0.9019	0.9140	0.8745
R067	WEEKDAY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.8054	N/A	N/A	0.8048	0.7694
R067	WEEKEND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.8805	N/A	N/A	0.8969	0.8600
R068	WEEKDAY	0.8840	0.8794	0.8719	0.8766	0.8782	0.8806	0.8756	0.8773	0.8520	0.8519	0.8772	0.8971
R068	WEEKEND	0.9211	0.9202	0.9213	0.9203	0.9274	0.9210	0.9285	0.9310	0.9003	0.8947	0.9202	0.9326
R069	WEEKDAY	0.9407	0.9404	0.9394	0.9402	0.9397	0.9392	0.9386	0.9395	0.9398	0.9385	0.9380	0.9390
R069	WEEKEND	0.9667	0.9663	0.9656	0.9652	0.9678	0.9651	0.9649	0.9642	0.9615	0.9667	0.9652	0.9629
R070	WEEKDAY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.8739	0.8717	0.8651	N/A	0.8674
R070	WEEKEND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.9262	0.9230	0.9236	N/A	0.9317
R073	WEEKDAY	0.8490	0.8395	0.8398	0.8489	0.8542	0.8458	0.8826	N/A	N/A	N/A	0.8217	0.8254
R073	WEEKEND	0.9463	0.9235	0.9288	0.9336	0.9399	0.9371	0.9292	N/A	N/A	N/A	0.9165	0.9242
R075	WEEKDAY	0.8155	N/A	N/A	0.8234	0.8258	0.8305	N/A	N/A	N/A	N/A	N/A	N/A
R075	WEEKEND	0.9105	N/A	N/A	0.9117	0.9205	0.9078	N/A	N/A	N/A	N/A	N/A	N/A
R076	WEEKDAY	0.6688	0.6784	0.6809	0.6919	0.6859	0.6940	0.7335	0.7142	0.6866	0.6642	0.6771	0.6860
R076	WEEKEND	0.7819	0.7953	0.8093	0.8054	0.8338	0.8185	0.8485	0.8458	0.7950	0.7949	0.7906	0.7901
R078	WEEKDAY	0.9227	0.9101	0.8998	0.8786	0.8801	0.8891	0.9050	0.8927	0.8885	0.8787	0.9014	0.9086
R078	WEEKEND	0.9600	0.9490	0.9514	0.9347	0.9562	0.9443	0.9511	0.9473	0.9423	0.9460	0.9539	0.9561
R081	WEEKDAY	N/A	N/A	N/A	N/A	0.9115	0.8984	0.8934	0.8899	0.8848	0.8924	0.9081	0.9179
R081	WEEKEND	N/A	N/A	N/A	N/A	0.9460	0.9381	0.9363	0.9253	0.9213	0.9292	0.9427	0.9475
R083	WEEKDAY	0.9518	0.9414	0.9293	0.9156	0.9248	0.9422	0.9571	0.9514	0.9397	0.9404	0.9066	0.9457
R083	WEEKEND	0.9722	0.9646	0.9650	0.9659	0.9715	0.9722	0.9759	0.9788	0.9700	0.9668	0.9512	0.9655
R084	WEEKDAY	0.8132	0.8505	0.8264	0.8314	0.8362	0.8480	0.8473	0.8575	0.8123	0.7781	0.8350	0.8363
R084	WEEKEND	0.9138	0.9256	0.9203	0.9166	0.9336	0.9251	0.9212	0.9264	0.8863	0.8583	0.9155	0.9146
R085	WEEKDAY	0.8820	0.8893	0.8887	0.8913	0.8915	0.8932	0.8937	0.8885	0.8831	0.8847	0.8906	0.8939
R085	WEEKEND	0.9451	0.9523	0.9487	0.9493	0.9516	0.9537	0.9533	0.9445	0.9425	0.9492	0.9521	0.9449
R086	WEEKDAY	0.7092	0.7407	0.7187	0.7145	0.7276	0.7387	0.7433	0.7287	0.7048	0.7068	N/A	N/A
R086	WEEKEND	0.8120	0.8394	0.8051	0.8023	0.8098	0.8139	0.8227	0.8033	0.7849	0.8026	N/A	N/A

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PTR		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
R088	WEEKDAY	0.9257	0.9276	0.9270	0.9270	0.9244	0.9263	0.9276	0.9277	0.9252	0.9255	0.9285	0.9275
R088	WEEKEND	0.9572	0.9585	0.9601	0.9599	0.9591	0.9577	0.9574	0.9588	0.9549	0.9586	0.9584	0.9592
R089	WEEKDAY	0.9608	0.9597	0.9594	0.9540	0.9467	0.9539	0.9543	0.9526	0.9508	0.9493	0.9428	0.9562
R089	WEEKEND	0.9745	0.9725	0.9742	0.9705	0.9675	0.9697	0.9705	0.9703	0.9682	0.9701	0.9682	0.9733
R091	WEEKDAY	0.8418	0.8467	0.8457	0.8434	0.8423	0.8448	0.8486	0.8532	0.8409	0.8398	0.8477	0.8452
R091	WEEKEND	0.9059	0.9069	0.9094	0.9046	0.9107	0.9074	0.9097	0.9142	0.9014	0.9077	0.9058	0.9064
R092	WEEKDAY	0.8732	0.8776	0.8781	0.8746	0.8760	N/A	0.8798	0.8785	N/A	0.8698	0.8713	0.8791
R092	WEEKEND	0.9261	0.9261	0.9280	0.9271	0.9294	N/A	0.9327	0.9320	N/A	0.9264	0.9184	0.9386
R093	WEEKDAY	0.8629	0.8663	0.8670	0.8636	0.8587	0.8307	0.8293	0.8328	0.8236	0.8207	0.8342	0.8434
R093	WEEKEND	0.9264	0.9269	0.9286	0.9284	0.9223	0.8981	0.9012	0.9023	0.9008	0.9026	0.9091	0.9093
R094	WEEKDAY	0.8681	N/A	0.8699	0.8693	0.8674	N/A	N/A	N/A	0.8631	0.8639	N/A	N/A
R094	WEEKEND	0.9409	N/A	0.9387	0.9343	0.9373	N/A	N/A	N/A	0.9354	0.9506	N/A	N/A
R095	WEEKDAY	0.9407	0.9454	0.9400	0.9451	0.9489	0.9480	0.9459	0.9408	0.9350	0.9327	0.9413	0.9464
R095	WEEKEND	0.9768	0.9768	0.9781	0.9754	0.9806	0.9786	0.9769	0.9760	0.9713	0.9724	0.9767	0.9746
R096	WEEKDAY	0.9752	0.9755	0.9750	0.9737	0.9735	0.9684	0.9666	0.9710	0.9696	0.9704	0.9726	0.9734
R096	WEEKEND	0.9838	0.9833	0.9833	0.9814	0.9822	0.9821	0.9803	0.9814	0.9792	0.9828	0.9825	0.9822
R097	WEEKDAY	0.7832	0.7888	0.7883	0.7880	0.7869	0.7933	0.8023	0.8011	0.7848	0.7785	0.7902	0.7899
R097	WEEKEND	0.8723	0.8736	0.8736	0.8715	0.8790	0.8767	0.8869	0.8802	0.8679	0.8732	0.8726	0.8800
R100	WEEKDAY	N/A	0.5997	0.6283	0.6315	0.6264	0.6582	0.6518	0.6192	N/A	0.6221	0.6408	0.6330
R100	WEEKEND	N/A	0.7508	0.7747	0.7683	0.7924	0.7849	0.7868	0.7617	N/A	0.7548	0.7450	0.7541
R101	WEEKDAY	0.9760	0.9727	0.9756	0.9748	0.9744	0.9743	0.9745	N/A	N/A	N/A	N/A	N/A
R101	WEEKEND	0.9853	0.9838	0.9824	0.9831	0.9837	0.9821	0.9824	N/A	N/A	N/A	N/A	N/A
S503	WEEKDAY	0.8459	0.8493	0.8524	0.8487	0.8541	N/A	N/A	N/A	N/A	0.8572	N/A	0.8547
S503	WEEKEND	0.9196	0.9189	0.9182	0.9163	0.9318	N/A	N/A	N/A	N/A	0.9267	N/A	0.9230
S612	WEEKDAY	0.7027	0.7124	0.7212	0.7482	0.7412	0.7394	0.7429	0.6939	0.6647	0.6522	0.7303	0.7155
S612	WEEKEND	0.8489	0.8405	0.8693	0.8663	0.8854	0.8682	0.8614	0.8213	0.7742	0.7732	0.8574	0.8369
S706	WEEKDAY	0.9652	0.9624	0.9562	0.9599	0.9575	0.9478	0.9545	0.9579	0.9555	0.9598	N/A	0.9581
S706	WEEKEND	0.9799	0.9777	0.9799	0.9775	0.9795	0.9744	0.9762	0.9785	0.9765	0.9786	N/A	0.9740
S803	WEEKDAY	0.8446	0.8526	0.8566	0.8517	0.8519	0.8590	0.8618	0.8623	0.8521	0.8477	0.8520	0.8659
S803	WEEKEND	0.9162	0.9162	0.9198	0.9154	0.9174	0.9138	0.9208	0.9195	0.9143	0.9170	0.9230	0.9174

2005 Axle Correction Factors From WSDOT Permanent Traffic Recorders

Weekday = Average Tues, Wed, and Thurs   Weekend = Average Fri, Sat, and Sun

PTR		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
S818E	WEEKDAY	0.8741	0.8676	0.8696	0.8719	0.8733	N/A	N/A	0.8544	0.8684	0.8518	0.8683	0.8648
S818E	WEEKEND	0.9389	0.9225	0.9236	0.9254	0.9408	N/A	N/A	0.9237	0.9284	0.9209	0.9254	0.9215
S818S	WEEKDAY	0.7822	0.7734	0.7865	0.7954	0.7942	0.8161	0.8188	0.7838	0.8017	0.7687	0.8246	0.8031
S818S	WEEKEND	0.9253	0.8874	0.8916	0.9023	0.9255	0.9122	0.9127	0.8895	0.9061	0.8877	0.9118	0.8982
S818W	WEEKDAY	0.9698	0.9716	0.9730	0.9620	0.9609	0.9583	0.9596	0.9604	0.9541	0.9467	0.9481	0.9647
S818W	WEEKEND	0.9743	0.9804	0.9865	0.9746	0.9705	0.9699	0.9732	0.9748	0.9687	0.9652	0.9579	0.9754
S819	WEEKDAY	0.9605	N/A	N/A	0.9614	0.9721	0.9648	N/A	N/A	0.9608	0.9581	0.9623	0.9561
S819	WEEKEND	0.9797	N/A	N/A	0.9787	0.9834	0.9829	N/A	N/A	0.9759	0.9782	0.9808	0.9784
S820	WEEKDAY	0.9382	0.9286	0.9503	0.9390	0.9229	0.9251	0.9361	0.9394	0.9316	0.9326	0.9392	0.9367
S820	WEEKEND	0.9618	0.9574	0.9697	0.9594	0.9572	0.9555	0.9606	0.9631	0.9606	0.9602	0.9610	0.9635
S824	WEEKDAY	0.9607	0.9602	0.9599	0.9590	0.9594	0.9590	0.9583	0.9575	0.9535	0.9557	0.9590	0.9599
S824	WEEKEND	0.9765	0.9742	0.9754	0.9740	0.9755	0.9737	0.9734	0.9725	0.9708	0.9732	0.9758	0.9762
S825	WEEKDAY	N/A	N/A	N/A	N/A	N/A	N/A	0.9383	0.9382	N/A	N/A	N/A	N/A
S825	WEEKEND	N/A	N/A	N/A	N/A	N/A	N/A	0.9581	0.9588	N/A	N/A	N/A	N/A
S826	WEEKDAY	0.8476	0.8465	0.8962	0.8666	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S826	WEEKEND	0.9141	0.9143	0.9326	0.9152	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S837	WEEKDAY	0.9030	N/A	0.9039	0.9030	0.9016	0.9025	N/A	0.8977	0.8961	0.8977	0.9028	0.9035
S837	WEEKEND	0.9463	N/A	0.9455	0.9437	0.9468	0.9450	N/A	0.9426	0.9382	0.9444	0.9445	0.9448
S838	WEEKDAY	0.7812	0.7779	0.7938	0.7890	0.7860	0.7890	0.8052	0.8057	0.7812	0.7759	0.7767	0.7770
S838	WEEKEND	0.8727	0.8701	0.8835	0.8812	0.8885	0.8808	0.8913	0.8913	0.8685	0.8708	0.8573	0.8637
S839	WEEKDAY	0.8888	0.8835	0.8840	0.8812	0.8805	0.8757	0.8736	0.8746	0.8705	0.8778	0.8838	0.8808
S839	WEEKEND	0.9249	0.9162	0.9212	0.9207	0.9198	0.9160	0.9114	0.9118	0.9066	0.9189	0.9219	0.9205
S840	WEEKDAY	N/A	N/A	0.9280	0.9441	0.9369	0.9360	0.9678	0.9804	0.9788	0.9119	0.8423	0.8499
S840	WEEKEND	N/A	N/A	0.9915	0.9777	0.9820	0.9735	0.9862	0.9893	0.9882	0.9689	0.9678	0.9897
S841E	WEEKDAY	0.8456	0.8534	0.8687	0.8622	0.8563	0.8491	0.8575	0.8424	N/A	N/A	N/A	N/A
S841E	WEEKEND	0.9245	0.9244	0.9354	0.9344	0.9383	0.9276	0.9237	0.9124	N/A	0.8455	N/A	N/A
S841W	WEEKDAY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.9407	0.9587	0.9624
S841W	WEEKEND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.9651	0.9735	0.9736

WSDOT uses data from permanent traffic recorders to generate monthly average weekday traffic to annual average daily traffic conversion factors. These factors are then used to estimate AADTs based on AWDTs from short duration counts. Although the weekday data used to generate the factors comes only from Tuesdays, Wednesdays and Thursdays, the factors are generally applicable to 48-hour or longer counts conducted between noon on Monday and noon on Friday.

Whenever possible, short duration count data should be adjusted using factors from a nearby permanent traffic recorder installed at a location with similar traffic patterns. However, due to the high cost of PTR installation and maintenance, WSDOT does not have an applicable PTR for every short duration count location on the state highway system. To address this issue, average factors are produced from groups of PTRs with similar seasonal traffic volume trends and definable commonalities in relation to functional classification of roadway, geographic area and/or traffic features (such as a relatively high proportion of recreational travel). The factors from a given group can then be considered applicable to short count locations that have characteristics consistent with those that define the group.

The seasonal factor groups currently used by WSDOT are:

GR-01: Urban Interstate
GR-02: Urban Non-Interstate
GR-03: Rural, Non-Recreational Interstate
GR-04: Rural Central Mountain (Moderate Recreational Influence)
GR-05: Rural, Non-Interstate, Non-Recreational West
GR-06: Rural, Non-Interstate Southeast (High Summer Peak)
GR-07: Rural, Non-Interstate, Non-Recreational Northeast
GR-08: Rural, Non-Interstate Southeast (Commute Routes)
GR-09: Rural Central Mountain (Strong Recreational Influence)
GR-10: Recreational West

GR-01 and GR-02 represent urban interstate and urban non-interstate highway locations respectively. GR-03 represents rural interstate highway locations, with the exception of the section of Interstate 90 passing through the central mountain region of the state. GR-04 and GR-09 represent this central mountain region, with the latter reflective of highways with an extremely high summertime traffic volume peak due to recreational travel. GR-05 represents typical rural locations in the western part of the state, while GR-10 reflects western locations that are much more influenced by summertime recreational traffic. GR-06 represents rural locations in the southeast of the state strongly influenced by seasonal agriculture-related traffic, while GR-08 represents rural southeastern locations with much less seasonal variation (such as commute routes). Finally, GR-07 represents typical rural locations in the northeast of the state.

The table below provides the 2005 monthly seasonal factors for each of these groups. To use them, multiply the AWDT from a short duration count by the pertinent group's factor for the month the count was conducted in.

2005 AWDT to AADT Conversion Factors by Group

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
GR-01	1.00	0.96	0.95	0.95	0.93	0.91	0.90	0.90	0.94	0.96	0.99	0.97
GR-02	0.99	0.95	0.94	0.93	0.91	0.90	0.90	0.90	0.92	0.94	0.97	0.96
GR-03	1.23	1.12	1.06	1.05	1.02	0.94	0.89	0.90	0.99	1.03	1.08	1.10
GR-04	1.78	1.58	1.44	1.32	1.16	0.99	0.88	0.91	1.06	1.19	1.44	1.45
GR-05	1.16	1.07	1.04	1.03	0.98	0.93	0.85	0.86	0.97	1.04	1.09	1.10
GR-06	1.40	1.23	1.12	1.08	1.02	0.95	0.88	0.88	0.99	1.04	1.13	1.28
GR-07	1.15	1.06	1.02	0.98	0.93	0.89	0.83	0.86	0.92	0.95	1.06	1.10
GR-08	1.20	1.08	1.02	0.99	0.95	0.90	0.86	0.87	0.92	0.95	1.05	1.15
GR-09	2.51	2.18	2.13	1.76	1.41	1.14	0.85	0.89	1.12	1.39	1.41	1.49
GR-10	1.52	1.29	1.23	1.15	1.09	0.94	0.77	0.75	0.93	1.14	1.31	1.32

Under ideal circumstances, seasonal factors that are specific to the locality a short duration count was conducted in should be employed. However, for most local agencies these will not be available. If so, seasonal factors calculated for the general area in which the agency is located should be used. (Seasonal factors from individual continuous traffic count locations monitored by the WSDOT Transportation Data Office are published within the Department's *Annual Traffic Report*, and may be useful in generating these area-specific factors.) If no localized factors are available, those provided in the table above can be utilized, although the following guidelines for their use are suggested. Group GR-02 should be used for all count locations within the boundaries of an urbanized area as defined by the U.S. Census Bureau, as well as within cities that are outside of an urbanized area but that have populations greater than 10,000. For cities of 5,000 to 10,000 people that are not in an urbanized area, the appropriate factor group will be determined by an examination of the character of local development; if the area is fairly compact and densely populated, GR-02 is likely appropriate; if not, one of the rural groups GR-05 through GR-08 is probably applicable. For all other counts (i.e., those conducted in unincorporated, non-urbanized areas or in cities with populations below 5,000 that are outside of urbanized areas), one of the groups GR-05 through GR-10 should be chosen based on geographic area and the proportion of annual traffic volume represented by traffic in the summer months.

If an estimate of the AADT for a section of highway that has not been counted in the current year is needed, and an estimate of the previous year's AADT for the section is available, a growth factor should be applied in order to estimate the current AADT. As noted in Section Three, if a data source is available that is representative of the specific locality, such as a historical set of local traffic counts, growth rates should be calculated from this data source and used. Otherwise, the growth rates given in the table below should be employed. The table provides growth rates by the same groups used for seasonal factors. The instructions given in Appendix Four regarding how to determine which seasonal factor group is most appropriate for a given count location should also be followed when deciding upon an appropriate factor group in relation to growth rates.

Growth Rate by Factor Group

(2004 to 2005)

Factor Group	Growth Rate
GR-01	1.0109
GR-02	1.0091
GR-03	1.0065
GR-04	0.9892
GR-05	0.9946
GR-06	0.9877
GR-07	0.9838
GR-08	1.0020
GR-09	1.0296
GR-10	0.9771

The following is the Federal Highway Administration's vehicle classification scheme.

1. **Motorcycles** (Optional) - All two or three-wheeled motorized vehicles. Typical vehicles in this category have saddle type seats and are steered by handlebars rather than steering wheels. This category includes motorcycles, motor scooters, mopeds, motor-powered bicycles, and three-wheel motorcycles. This vehicle type may be reported at the option of the State.
2. **Passenger Cars** - All sedans, coupes, and station wagons manufactured primarily for the purpose of carrying passengers and including those passenger cars pulling recreational or other light trailers.
3. **Other Two-Axle, Four-Tire Single Unit Vehicles** - All two-axle, four-tire vehicles, other than passenger cars. Included in this classification are pickups, panels, vans, and other vehicles such as campers, motor homes, ambulances, hearses, carryalls, and minibuses. Other two-axle, four-tire single-unit vehicles pulling recreational or other light trailers are included in this classification. *Because automatic vehicle classifiers have difficulty distinguishing class 3 from class 2, these two classes may be combined into class 2.*
4. **Buses** - All vehicles manufactured as traditional passenger-carrying buses with two axles and six tires or three or more axles. This category includes only traditional buses (including school buses) functioning as passenger-carrying vehicles. Modified buses should be considered to be a truck and should be appropriately classified.

NOTE: In reporting information on trucks the following criteria should be used:

a. Truck tractor units traveling without a trailer will be considered single-unit trucks.
b. A truck tractor unit pulling other such units in a "saddle mount" configuration will be considered one single-unit truck and will be defined only by the axles on the pulling unit.
c. Vehicles are defined by the number of axles in contact with the road. Therefore, "floating" axles are counted only when in the down position.
d. The term "trailer" includes both semi- and full trailers.

5. **Two-Axle, Six-Tire, Single-Unit Trucks** - All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, et cetera, with two axles and dual rear wheels.
6. **Three-Axle Single-Unit Trucks** - All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, et cetera, with three axles.
7. **Four or More Axle Single-Unit Trucks** - All trucks on a single frame with four or more axles.
8. **Four or Fewer Axle Single-Trailer Trucks** - All vehicles with four or fewer axles consisting of two units, one of which is a tractor or straight truck power unit.
9. **Five-Axle Single-Trailer Trucks** - All five-axle vehicles consisting of two units, one of which is a tractor or straight truck power unit.
10. **Six or More Axle Single-Trailer Trucks** - All vehicles with six or more axles consisting of two units, one of which is a tractor or straight truck power unit.
11. **Five or fewer Axle Multi-Trailer Trucks** - All vehicles with five or fewer axles consisting of three or more units, one of which is a tractor or straight truck power unit.
12. **Six-Axle Multi-Trailer Trucks** - All six-axle vehicles consisting of three or more units, one of which is a tractor or straight truck power unit.
13. **Seven or More Axle Multi-Trailer Trucks** - All vehicles with seven or more axles consisting of three or more units, one of which is a tractor or straight truck power unit.